The Slashdot Effect:
Analysis of a Large-Scale Public Conversation on the World Wide Web

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Abstract

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Slashdot bills itself as the source of "News for Nerds. Stuff that Matters." The site itself is a collective "web log" (*blog*), a way of concentrating news and other information from the web and commenting upon it. In addition, reviews and other original materials are presented. In some respects, it bears a considerable resemblance to traditional print and on-line newspapers, but with a heavier reliance on contributed and found stories, and a greatly expanded section of letters to the editor.

This dissertation argues that Slashdot emerged from collaboration among a group that shares a cultural commitment to open discussion. This combination—the dedication to open discussion with the technology to facilitate mass interaction—allows Slashdot to perform the larger function of linking social groups, voices, and ideas that would otherwise remain separated. It is a force that acts against what has been called the "balkanization" of the world wide web, the formation of tight-knit hyperlinked clusters of web site in which the range of topics and viewpoints is fairly

narrow. Slashdot is not perfect in this regard, by any means. Its users employ their own exclusionary practices, especially toward newcomers, and many remain uninterested in the technological discussions that take place there. Despite this, the number of those who read and participate on Slashdot has continued to grow exponentially over the last three years. More than most web sites, Slashdot exploits the connective structures of hypertext to unite disparate ideas, bringing them to a much wider audience than they would otherwise enjoy.

Slashdot represents an early example of a "virtual public." By encouraging mass interaction and large-scale conversations, it falls somewhere between traditional explorations of organizational communication and larger-scale mass media systems. It is in some ways a distinctive application of computer networking. The exploration of the site presented here takes several forms. The culture of open source and computer professionals generally is discussed, examples of the discussions on Slashdot are analyzed, the context of Slashdot within the larger hyperlinked web is presented, and through two example cases, the interface between Slashdot and the traditional press is explored.

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Chapter 0:

Introduction

It is all too easy to find indications that new information and communication technologies are enforcing and consolidating social power, that they are reinforcing capitalism as the overarching global logic and consumerism as the only legitimate channel of culture. One need only chart the gradual and decisive annexation of internet companies by large transnational conglomerates, the increasingly extended reach of intellectual property law, or the pages of *Wired* magazine to see that this is true. As Beniger (1986) suggests, the information age is the most recent step in a centuries long "control revolution," providing the means to control widespread networks of social organization.

This dissertation explores a socio-technical system called Slashdot, a system that has served as a model for increasingly popular web-based large-scale collaborative discussion. Slashdot represents an interesting innovation. It will be argued that it emerged from the collaboration of a group that shares a cultural commitment to open discussion. This combination—the dedication to open discussion with the technology to facilitate mass interaction—allows Slashdot to perform a larger function of linking social groups, voices, and ideas that would otherwise remain separated. It is a force that acts against what has been called the "balkanization" of the world wide web—the formation of tight-knit hyperlinked

clusters of web site in which the range of topics and viewpoints is fairly narrow (Van Alstyne & Brynjolfsson. 1996). Slashdot is not perfect in this regard, by any means. Its users employ their own exclusionary practices, especially toward newcomers, and many remain uninterested in the technological discussions that take place there. Despite this, the number of those who read and participate on Slashdot has continued to grow exponentially over the last three years. More than most web sites, Slashdot exploits the connective structures of hypertext to unite disparate ideas, bringing them to a much wider audience than they would otherwise enjoy.

This dissertation can be roughly split into two sections. The first section explains what Slashdot is and how it works. It examines the manifest structure of the web site and the reason for its creation (chapter one), the culture that supports it (chapter two), and the social and communicative behaviors that have emerged on the site (chapter three). All of these combine to make the technology what it is, an effective way of managing discussion and consensus-building among a very large group. The second part of the dissertation measures the effect of this technology on the wider world of the web and media generally. It first analyzes the sites that are connected to Slashdot and attempts to discover what role the Slashdot site plays within this larger web (chapters four and five). It then, in chapter six, moves beyond the web and uses two example cases to suggest how the discussion on Slashdot might affect a wider media discourse about public policy.

The Scale of Communication on Slashdot

Many have argued, and some continue to argue, that the fundamentally decentralized nature of networking technology precludes centralized systems of control. Pool, for example, recommends that one look at the structure of a given communications system. While television, radio, and other broadcasting technologies tend to be inherently undemocratic because they are, by necessity, controlled centrally, "freedom is fostered when the means of communication are dispersed, decentralized, and easily available, as are printing presses or microcomputers" (1983, p. 5). Since the internet is arguably the most decentralized form of mass media yet devised, many expected that it would be "naturally independent" (to borrow from John Perry Barlow's 1996 "Cyberspace Independence Declaration") from centralized structures of ownership and governmental control; that wherever computer networking was introduced, more diverse and democratic structures would spring up of necessity. Not only was the internet immune to the centralizing tendencies of broadcast media, easy access meant that it was even more democratic than printing: as Justice Stevens noted in the decision on the Communications Decency Act, "any person with a phone line can become a town crier with a voice that resonates farther than it could from any soapbox… [t]hrough the use of Web pages, mail exploders, and newsgroups, the same individual can become a pamphleteer" (*Reno v. ACLU*, 1997).

Despite these arguments, finding alternatives to a new mass culture of consumerism is not an easy task. Barber (1995) describes a newly complex world, one in which the contending forces of globalization and tribalization combine to create ever more intricate and complicated structures; a process he refers to as "glocalization." There are, of course, several widely cited examples of these technologies being used in the service of those who are traditionally less empowered. Among these, the use of computer networks and other media by the Zapatistas has been widely cited as an example of the new world of activism. Others have indicated the organization of protests the Seattle Round of the World Trade Organization meetings (and the protests at subsequent meetings), and the use of the web by otherwise obscure groups who find far-flung connections. However, the vast majority of surfers limit themselves to sites created by media giants, and it is rare to find independent web sites within the coveted few hundred sites that receive the majority of hits. In an "attention economy," the relative ability of media giants to create "sticky" content (content that continues to attract viewers), ensures that they will remain the predominant force in global networking. Certainly, one could turn to some of the new giants—Microsoft and AOL, for example—and argue that the information revolution has led to significant changes. But the web of today is not the web of 1995. While the traditional media industry might have appeared slow to colonize cyberspace, that process is now all but complete. Robert McChesney

warned in 1996 that the internet would, unless checked, follow patterns similar to commercial radio. His prediction that large commercial interests would come to dominate is nearly complete. While there remain significant marginal areas of the web and other communication networks supported by the internet (and these will probably always remain), the mainstreaming of the internet has been accompanied by its commercialization and control by large, multi-national corporations and, increasingly, by national governments[1].

Given this seeming affinity between previous mass media and the internet, it would seem to make sense to apply mass media models, theory, and methods to study the web and the internet generally. In many cases this has happened, with approaches ranging from uses and gratifications to survey research (Coomber, 1997; Ebersole, 2000; Ko, 2000; Mings, 1997; Morris and Ogan, 1996; Sadow, 2000; Strauss, 1996). On the other hand, it would be extraordinarily myopic to ignore the other side of the internet, the billions of email messages sent each day. Email, newsgroups, and groupware are far more reminiscent of previous networked media—including the telephone, telegraph, and postal system—than they are of the mass media. Again, some have studied email and small group boards from the perspective of rhetorical and conversation analysis (Black et al, 1983; Davis & Brewer, 1997; Hermann, 1995), as well as organizational communication theory

[1] As demonstrated, for example, by recent negotiations on the international Convention on Cybercrime and the Hague Convention on Jurisdiction and Foreign Judgments, which allow for some interpenetration of national jurisdictions (Waldmeir, 2001; Stern, 2001).

(Feenberg, 1989; Kiesler, 1994; Kiesler & Sproull, 1991). Much of this communication is increasingly found on the web, in addition to newsgroups and email, as hypermedia subsumes earlier internet applications.

Slashdot, the prototypical "web log" falls somewhere between these extremes. It is still an interaction among a group, but that group is so large (likely well over a million people) that it defies the theory and methodology of organizational communication. Likewise, treating it as a mass medium—which often equates to a *broadcast* medium—again only recognizes part of the picture. Because the content of Slashdot is largely created by its users, it is not at all like a traditional mass medium.

Of course, there are tools and perspectives that can be taken from communication research at both the mass scale and the organizational scale that may be applied to this new public space between the extremes. Mass communication researchers are often concerned with how a message is processed once it is received by an audience. This is most clearly seen in studies of information diffusion that started with a model of two-step flow and then continued on to become multi-step models (DeFleur & Larsen, 1987; Katz, 1957; Rogers, 1983). Likewise, organizational scholars have been interested in the communication in large organizations and communities. Much of this work sees large groups as little different from smaller groups, and what differences exist are found in an increase in

hierarchy as organizations grow larger, and the concomitant loss of meaningful social ties (Katz & Kahn, 1978).

The idea that the smaller scales of mass communication and the larger scales of organizational communications can be bridged is a relatively new one. Computer networking, and especially community networking, has provided a venue that is well suited to studying this scale, which has been called by some "mass interaction" (see Van Deusen et al, 1995/6; Wellman et al, 1996; Wellman, 1999; also chapter 1, below). The traditional research methods of mass communication, relying heavily on sampling and demographic information, are not particularly useful in examining the more difficult relational data needed to understand mass communication. While such relational approaches, including social network analysis, have been used extensively in organizational communications, they have not until recently been used on the very large scales needed to study mass interaction. Slashdot represents the prototypical large community weblog, in which users are bound by the site itself rather than a more structured organization. As the following chapters will show, studying this network technology requires an eclectic mix of approaches borrowed from other scales of media study.

The Culture of the Internet and the Culture of Hacking

It is all too easy to see the battle over the control of cyberspace as one between the haves and the have-nots, between the data-rich and data-poor, and to ascribe certain political aspirations to those groups. Far more interesting, it would seem, would be describing the peculiar characteristics of those who make up the vanguard of the new computer networks. The construction of the internet, after all, is not one of machines, but of people. The technologies that make up the internet, in terms of hardware, could have been implemented far earlier than they were. The explosion of the "commodity internet" in the 1990s was less a result of developments of hardware or software (though the popularization of distributed hypertext should not be ignored), and more one of pioneer creators of content and community. As part of the rhetoric of the 2000 presidential election, Al Gore was (incorrectly) quoted as having claimed to have "invented" the internet. This idea struck most as preposterous because no one "invented" the internet, it emerged as a result of a large set of technologies, applications, and formal and informal agreements. Although there was no single "inventor" of the internet, it was generally accepted that a large group of people were responsible for the creation of the necessary ingredients.

This group of computer programmers and others, who collectively identified themselves as "hackers,"[2] made up a relatively insular culture that had little impact on mainstream culture until the late-1980s. It would be wrong to say that they were entirely invisible—an article by Stewart Brand in a 1972 issue of *Rolling Stone* described hackers in ways that are familiar today—but along with other engineers, they were often seen as socially inept, obsessed, and "nerdy." By the 1990s, perhaps due in large part to the economic successes of hackers and very visible cultural icons like Bill Gates and Steve Jobs, "nerds" were increasingly proud of the moniker.

As hackers gained cultural currency, a subgroup emerged from them that would be christened the "digerati" by *Wired* magazine. This group became the self-appointed mouthpieces of the new economy, gaining the ear of both the public at large and policy makers. *Wired* would go on to proclaim loudly the style and values of the *digerati*, and played a role far more active than observer of the information revolution. The magazine's outlook—despite the popularized stance—echoed the culture of the computing community far better than did mainstream publications of the day. In particular, it played to a strong libertarian sentiment within the culture, the entrepreneurial spirit, and a love of novelty. The myths of the Silicon Valley, of

[2] As will become clear later in this work, I use the term hacker not in its more popular, pejorative sense of a criminal who breaks into computers. Rather, I refer to someone who belongs to a group of people who are interested in the way things work and working on them. It is roughly synonymous with "tinkerer," though with a hint of obsession and at least some relation to information and communication technologies.

moonlighting engineers building revolutionary technologies in their garages and creating new corporate empires, spread across the United States and, eventually, around the world. Nerds were not yet granted the status of rock stars, but commanded far more public attention than they had in the past. Cyberspace, from the perspective of *Wired*, was firmly rooted in the culture of the San Francisco Bay Area, and reflected a set of values that had evolved there. *Mondo 2000*, an alternative publication, also reflected this particularly localized culture, but eventually lost out to the broad appeal of *Wired*.

The pages of *Wired*, and its advertisements, would be nothing new to young urban professionals. Though the recent collapse of the "dot-com" bubble may slowly change this, until recently the upwardly mobile professional was co-terminus with the information technology entrepreneur. In appealing to a large demographic of more enthusiastic consumer spenders, the magazine failed to tell the whole story of hacker culture. In moving beyond the nerd, it only selectively reflected the culture of computer professionals. While glamorizing the dot-com dream, it set aside what many see as a "hacker ethic."

If there is an information revolution, it will not be found in the controlling classes, nor in the mass of the population, but in the peculiar middle place: those who create and maintain the technology. As we shall see, there is no shortage of theorists who look at the role of these technologists, but with the popularization of

computer networking, the values held by a growing segment of the population have the potential to affect larger social structures. Computer professionals have always been in the business of creating processes of exchange and control. In the 1970s, these processes affected a relatively small number of people. That has changed. It is no longer only large corporations who use computer networking. While a "good hack" might once have been appreciated by other programmers on a particular campus, or on several campuses, a new technology now has the potential of affecting much of the global population.

The hacker culture has already made significant changes in the way software is constructed and exchanged, by adopting the ideals of "open source." Computer programs can be very complicated to create, for particularly complex systems like operating systems, it may take thousands of programmers working in concert to complete a design. The complexity of such a project is on a par with the design of a jumbo jet. Yet a loosely affiliated group of computer programmers, working around the world in their spare time, created an operating system called GNU/Linux. This self-described "open source community" has also created software in almost every area of computing, software that often far out-performs commercial systems. The culture that has emerged around this technology may have far-reaching consequences not only for the design of computer programs but for many of the environments in which information processing is important.

As information technologies have become increasingly intertwined with policy and economic issues, this relatively small group has a significant, and increasing, amount of influence on how our institutions work. There is still, certainly, the possibility that hackers will abuse that power, and that we will see a re-concentration of power in the hands of those with technological skills. An examination of the values and expectations of this group, though, as I argue in the second chapter, provides some hope that computer professionals may take up a new role in society, as a new form of interface that allows for shifts in technology and policy away from traditional seats of power. Slashdot is an example of the ways in which culture becomes ingrained within a particular technology, and helps to concretize its accepted norms.

It would be wrong to equate all computer professionals with this hacker culture or ethic. Indeed, there are many who work in the field who are uninterested or even actively opposed to the idea and ideals of the open source community. Moreover, the word "community" is problematic, and setting it up as an object of study means having some view of who is and is not a part of the community. Open source is often used to modify the terms "community," "movement," and "revolution," though it is not entirely clear how such an amorphous group can be so labeled. My initial interest was not so much in the culture of open source, but in exploring it as a community. Of course, the two are inextricably related, but Deutsch

(1966) provides a useful distinction. He notes that communities are defined by their communications networks, while culture is what is carried by those networks. Clearly, given the amorphous nature of the open source community, we would expect the networks that bind them to be equally informal.

Why Slashdot?

Slashdot bills itself as the source of "News for Nerds. Stuff that Matters." It is as close to an official organ of the open source movement as exists. The content can seem, on first blush, to be very eclectic. The site itself is a collective "web log" (*blog*), a way of concentrating news and other information from the web and commenting upon it. In addition, reviews and other original materials are presented. In some respects, it bears a considerable resemblance to traditional print and on-line newspapers, but with a (possibly) heavier reliance on contributed and found stories, and a greatly expanded section of letters to the editor. Because of its place in the communicative environment, it provides an interesting object of study. There are those who study widely-read newspapers like the *New York Times* in order to discover how information that reaches the public may be biased by news processes and other internal and external influences (e.g., Bennett, 1997). Others have examined letters to the editor in order to gain some basic understanding of audience reactions to news (e.g., Sigelman & Walkosz, 1992). Slashdot provides a unique

form of moderation of these comments, one that allows for peers to rate the importance and appropriateness of a particular comment. As such, it represents a new form of media—not quite mass, but too large to be group.

In the next chapter, we take a closer look at what open source is, and how Slashdot works. As with much of the internet, it is important to recognize the degree to which content has been abstracted from the hardware upon which it works. Earlier forms of media tied ideas and discourse to physical elements. Taking the content from a book and placing it on an audio tape, for instance, requires a significant amount of work. Computer networking, and especially internetworking, is predicated on interoperability. The internet can run over any kind of computer and many things that we would not consider a computer at all. As a result, the technology is extraordinarily malleable and can easily be affected by the culture that surrounds its use.

For any technology, it is difficult to separate its technical from its cultural elements. Carolyn Marvin (1987), for instance, shows how what we think of as the telephone today owes much more to the social and cultural milieux in which it emerged than to any arbitrary arrangement of mechanical parts. As with other technologies, Slashdot is "a scene of struggle… a social battlefield… a parliament of things on which civilizational alternatives are debated and decided" (Feenberg, 1991, p.14). The cultural influence is particularly important in computer

conferencing software (Feenberg, 1989). For this reason, it is vital that we explore the technology of Slashdot within its cultural context in the following two chapters.

Chapter 1:

Open Source, Hacker Culture, and Slashdot

> For my culture and my people, this is the moment we have been waiting for for 20 years.
>
> - Eric Raymond
> (quoted in Leonard, 1998)

"Open source" is a term that was, only a few years ago, rarely heard outside of the computer programming field. It refers to the source code of a computer program, the formalized language that programs are written in before being automatically translated into "object code," or a form directly executable by a particular computer. At first blush, this certainly seems to be a topic technical enough that it would hold little interest to those not engaged in professional programming tasks. In fact, the implications of open source are important, and the kind of social structures and interactions it has engendered are increasingly being adapted to novel contexts, including experiments in open source journalism and Harvard's "OpenLaw" project, among others.

More than just a set of ideals, "open source" is part of the technology of Slashdot. Without the shared commitment to open exchange of ideas, peer criticism, and structures that encourage the "rationalization" of such exchanges, Slashdot could not exist. To gain a better understanding of the relationship between open source and Slashdot, both are briefly introduced below. A more thorough discussion of the resulting culture is pursued further in the next chapter.

Fundamentally, open source implies a radical form of participatory engineering. In most cases, the source code of a program or application is distributed along with the final product. An analogy might be made to the manufacture of automobiles[1]. On the one hand, you might have a manufacturer who leased automobiles without describing too much about how they actually worked, and with the hood locked so that only certified mechanics could gain access. If the car broke down after delivery, you would have to return to the factory to have it serviced. Since the internals of the vehicle would remain unknown, and since the manufacturer only leased the cars, rather than selling them, adding modifications or hot rodding the automobile would be impossible. Though it is difficult to imagine such a manufacturing and maintenance model would work in the world of automobiles, it is very similar to how most software is created and distributed. Only the executable form of the software is licensed, and though the user may be able to make some small adjustments (the equivalent of moving the seat), generally she is bound to buy fixes and updates from the original manufacturer.

An alternative approach would be to distribute an extremely explicit list of design specifications, instead of the end vehicle. Each user would then be able to construct her own automobile according to the specifications. Small changes and updates could be distributed, and enterprising drivers might make small improvements

[1] Bob Young, one of the founders of Red Hat, has used this analogy in the past.

to the car (larger cup holders, improved brakes, etc.) that they would then distribute to other drivers. Since automation would make the construction of the cars a trivial affair, the real value would be the instructions and specifications for creating the automobile. Of course, this raises an important question. Since these instructions are easily copied and modified, how would any engineering company be able to stay in business. Indeed, the ability to protect such designs, through patents, trademarks, and trade secrets, was intended to encourage companies and individuals to innovate by providing a temporary monopoly. It would be extremely difficult to enforce such a monopoly if the designs were distributed along with or instead of the final product. The analogy is a bit skewed, since very few of us have access to an automated automobile assembly line. In the case of computers, however, every potential user already has access to the tools needed to "build" a piece of software, given the source code.

The idea of an automobile manufacturer actually distributing detailed designs with a new car seems far-fetched at best. However, the same approach is familiar to the academic. Generally, when we do work, especially work in science, we distribute not only our findings, but the procedures we used to reach that end. Rather than restricting that distribution, we encourage it. When others make use of our work, modify it, or replicate it, it serves both as a contribution to the collective store of knowledge and as a vindication of our own efforts. Indeed, the world of academia

provides an important prototype for open source software production, and the two communities overlap in important ways.

Mainstreaming of Open Source

Below, an introduction to the impact of GNU/Linux and Apache is provided. Before moving on to these more familiar examples, I hope to touch on an earlier instance of open source. In December of 1972, Stewart Brand published an article in *Rolling Stone* on the first successful computer game: Spacewar. We will return to this article in the next chapter, as it represents a unique convergence of the idea of the hacker with a popular magazine, and provides some hints as to what larger social function hackers might play. The article ended with an implementation of Spacewar written in a programming language called Smalltalk by Alan Kay, who was working as a researcher for Xerox. Spacewar had been played on college campuses for over a decade at this point, and had always been "open source," as was virtually all computer software at this stage. The source code made its way from campus to campus, often in written form to be modified, entered into computers, and compiled into executable programs. These modifications were made in order to make use of local equipment (referred to as "porting" the program) or to add features: simulated gravity, more players, and electrical shocks to losers, for example.

Distributing games via magazine copy was the norm for much of the decade. *Byte* magazine and others routinely included source code listings with their articles. Eventually, these would be augmented with software for the home market that was distributed on cassette tapes, on cartridges, on floppy diskettes, and on optical media. By the late 1970s and early 1980s, software was less and less thought of as a service, and increasingly considered a product. Commercial software producers were not likely to include the source code with their products, and as the market matured, it was increasingly difficult to find the source code of needed applications.

Shareware is sometimes confused with open source software. Shareware is software that is distributed on a trial basis, often does not include the source, and requires the user to register and pay a fee if she continues to use it. Though it is easy to conflate the two, "open source" differs in that it does not restrict re-distribution in any way, and provides the user access to the inner workings of the software. There is an important difference between software that is simply free of charge (Internet Explorer, for example), and software that can be openly modified and improved upon. This idea is often abbreviated using the four-word formulation: "free speech, free beer." Most open source software is free like free beer; that is, free of charge. While this has arguably had the greatest impact on its rise in popularity (Wayner, 2000, pp. 84-6), many programmers feel that it is more important to think of software as free like free

speech; that is, a public good that should not be limited by governmental or private concerns.

The term "open source" is a fairly new one[2]. It came about in 1998, as part of the Open Source Initiative. It indicated a new approach that was designed as an alternative to the original calls of the Free Software Foundation and Richard Stallman, an approach that was less antagonistic to the business world[3]. At the end of 1997, Eric S. Raymond had been distributing an essay called "The Cathedral and the Bazaar" (1999) that had been well received both among those who created open source software and those in the commercial software industry. Soon after he had written it, Netscape announced plans to open the source code of their newest browser. Those involved in free software, including Raymond, gathered to discuss how best to ensure the ideals of free software meshed well with the objectives of profit-seeking corporations.

Their solution was detailed in the Open Source Definition (OSD). The OSD requires more than just distributing source code along with a program. The definition (available at *http://www.opensource.org*) specifies nine criteria for a project to be considered "open source":

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[2] New, that is, when used in the sense of open computer source code. The term has been used for some time to refer to reports made available that did not rely on classified sources of information.

[3] There is a significant division among those who use the term "open source" and those who remain true to the Richard Stallman term "free software." I have chosen deliberately to avoid this debate. I use "open source" because it seems less confusing, and because I am not sure that the substance of the debate is particularly interesting or valuable.

1. **Free redistribution**: anyone may reproduce and redistribute the software.
2. **Source code**: all source code must be distributed or easily available.
3. **Derived works**: You must allow users to modify the work, and redistribute these modifications.
4. **Integrity of the author's source code**: while modifications must be allowed, authors can require that the original code be clearly identified as such.
5. **No discrimination against persons or groups**: open source software must be usable and able to be modified by all.
6. **No discrimination against fields of endeavor**: the author cannot tell the user how the software may or may not be used.
7. **Distribution of license**: the license must be redistributed with the program or its derivatives.
8. **License must not be specific to a product**: the license applies not only to the entire software package, but to subsets of it.
9. **License must not contaminate other software**: other software that is not open source can be packaged with open source software.

These nine criteria describe a particular way of licensing software. They are not the only way of creating free software, but are designed specifically to allow companies to engage in open source in a limited way. Note that they do not prohibit licensees from

charging for their software. This has allowed for a number of companies to sell distributions of the Linux operating system. Red Hat (*http://www.redhat.com*) is among the more successful Linux distributors. The OSD also allows for commercial companies to distribute open source products along with their own intellectual property. This has attracted IBM, HP, and SGI, among others, to link themselves with the open source project.

Free software, now under the new umbrella of open source, received a tremendous boost when Microsoft, in filings with the SEC, claimed it as a serious competitor, a claim that was then provided as a defense in the anti-trust suit against it. Linux, until this time an open source operating system that only a computer programmer could love, benefited greatly from the publicity (Doebele, 1998). The governments of China, Mexico, and Great Britain have taken the Microsoft claims to heart, and each reported that they plan on making significant use of Linux. By the middle of 1999, Microsoft claimed that Linux was outselling Windows 98 in key retail chains (Lettice, 1999). By 2000, on the heals of the President's Technology Advisory Committee recommendation that the federal government back open source, an article in the *New York Times* made this assessment: "open source, once viewed as an ideological movement at the fringes of computing, is moving into the mainstream" (Lohr).

From Ideology to Download: GNU/Linux

There are now a number of successful open source projects that could be used to demonstrate that the open source way of organizing and creating software can be successful. Many of these, like an application called The Gimp, provide functionality (in this case, a program that is very reminiscent of Adobe Photoshop) that is already available on the market. Others, like an animation package called Blender, tackle familiar problems in unique ways. But open source software would remain at the margins if not for two successful systems: the Apache web server and the Linux operating system. Linux does not yet enjoy broad popularity as a workstation OS, but in part due to the success of Apache, it claims a large and growing segment of the server market.

A functional open source operating system is something of the Holy Grail of free software. Linux seems to be the best current answer to that quest. It is one of a number of derivatives of the Unix operating system, the creation of which was led by Ken Thompson at Bell Laboratories in 1969. Unix, in various flavors, was freely available until 1977, when AT&T decided to derive profits from the operating system—to "productize" it, in the newspeak of the dot-com era. For the first time, the operating system was not included with the purchase of hardware. Perhaps more importantly, it was no longer possible to easily improve the operating system and distribute your improvements.

Richard Stallman, a hacker at the MIT AI lab who is uniformly referred to as RMS, reacted to this in 1983 by starting the GNU[4] project to create a free alternative to Unix. This idea was formalized in "The GNU Manifesto," which he distributed in 1985. In it, Stallman writes that he is developing a "complete Unix-compatible software system" and that he is in need of help and resources. More than just calling for this creation, Stallman raises and rebuts many of the problems or questions about the process and the judiciousness of encouraging the distribution of free software. The GNU project made important contributions, among them a text processing program called Emacs and a C compiler called GCC[5]. The latter would be instrumental in the eventual development of Linux. While the project failed to produce a cohesive, usable derivative of Unix, it did produce most of the basic low-level utilities and libraries needed for the operating system.

The missing element was what was called the "kernel," the part of the operating system that was at its most basic level, and managed how processes were handled by the computer hardware and built-in software. In 1991, a student at Helsinki University named Linus Torvalds, using the libraries and tools developed as part of the GNU project, along with a very basic operating system called Minix (the source code for which was published as an appendix in a textbook on operating systems; Tannenbaum, 1987) began working on a usable kernel that would run on the 80386

[4] GNU is a recursive three-letter acronym: GNU's Not Unix.
[5] A "compiler" is a program that translates source code—in this case a program written in C—into machine-readable and executable object code.

processor. The original intent of the GNU project was to create an operating system for computers far more powerful than the "home computers" that were beginning to gain popularity. The 386 was hardly a powerhouse, but as Torvalds proved, it was capable of effectively running a Unix-like system. The system was quickly named Linux, after its pioneer. There were other contemporaneous projects, but as Eric Raymond (1999) suggests, Linux was as important for its organizational innovation as it was for its technological excellence. Unlike similar projects undertaken around the world, from the very beginning, Linux encouraged a kind of chaotic race to improve, with changes being offered from every corner. When challenged by Professor Andrew Tannenbaum (who had written the Minix operating system on which Torvalds based his system) to explain how he planned to keep control of his project, Linus responded: "in two word (three?): I won't" (Tannenbaum & Torvalds, 1999).

The success of Linux has been rapid and surprising. That success has happened mainly in the server market, in large part because of the Apache web server. Linux existed at the nexus of three elements that were all growing rapidly. First, it drew on long-brewing sentiment and development work of thousands of programmers around the world. Second, because it was based on an operating system for "serious computing" from the very beginning it was an operating system that was built for networking, and integrated well into the exponentially expanding internet. Finally, it was an operating system that exposed the power of the rapidly improving personal

computer. By binding these three groups together, Linux ensured its growth. Apache runs over 60% of all web servers on the net, as compared to second-place Microsoft's 29% market share (E-Soft, 2001).

It has encountered more difficulty in expanding in the desktop market. Some among the open source community[6] attribute this to tactics undertaken by their chief competition, Microsoft. A leaked internal memorandum from Microsoft suggested that it would attempt to discredit Linux by spreading "FUD" (fear, uncertainty, and doubt). Others recognize that most end-users are willing to put up with the expense and shortcomings of the Windows operating system rather than face the learning curve that is part of Linux. In either case, it seems clear that the number of Linux users continues to grow in the US and abroad..

Which leads us to the question: why an operating system? Increasingly, open source applications developed in and for Linux, including Blender, the Gimp, the Python programming language, and the Apache web server, are being ported to Windows systems. The operating system was important to the GNU project because it represented the most basic piece of software. Stallman wanted to get to the point (and since has) that it was unnecessary to sign software licenses for anything he used. Even more importantly, Linux provides a shared baseline from which a community can

[6] Here and elsewhere I use the term "community" loosely. Though fraught with theoretical baggage, despite receiving a great deal of attention from sociologists and from those who study computer networks. It seems a more appropriate term than "audience" or "contributors," each of which imply a certain directionality to the communication, and it is the term most often used by those who participate in open source (or as it will be used later, on the Slashdot site) to describe themselves.

work. Open source software requires a critical mass of computer professionals. The quality and quantity of software produced increases exponentially with the number of active members of the community. Significant differences in the operating systems of those working on open source projects would ensure that such critical masses were hard to come by. The user base for Linux appears to be increasing, and regardless of the merits of the operating system, this will ensure the health of this new culture of software.

The success of Linux inspired Eric Raymond to write "the Cathedral and the Bazaar," an essay on the social organization of open source projects that has been widely read and commented upon. Raymond is the iconoclastic standard-bearer for the open source movement; while there are many others that had significant impacts on the culture of hacking, Raymond will likely be best remembered for his interpretation of the culture itself. Building this bridge from the hacker culture to the mainstream had a significant impact on the world of software development. As I will argue in the next chapter, it may also have profound effects on society as a whole.

The essay provides a pragmatic explanation of how to "do" open source. Most people involved with computers knew of the GNU project, and many could at least sympathize with its intent. Fewer knew how the nuts and bolts of collaborative work came together, and more importantly, how to sell this to managers who were suspicious of a more anarchic approach to software design. This element of the essay

provided an important bridge to the mainstream. Less public attention was paid, perhaps, to some of the "softer" elements of the essay, those that spoke to the cultural and social implications of open source, those that are ultimately more important in terms of social and cultural change.

Hacker Culture

It would be shortsighted to say that everyone who programs becomes part of an encompassing community. At the same time, computer programming is often an inherently collaborative process, and one with its own set of myths and its own structure of ethics. Like scholarly endeavors, programmers recognize that in very real terms their own work rests on the shoulders of giants. They may, and often do, work individually on projects, but these projects must fit into a maze of existing systems in order to be viable. Arno Penzias notes that individual scientists (and small groups of scientists) working within a professional network of ideas and information have made the most important scientific discoveries. "None required massive organizational support or direction. At the same time, however, each of the scientists involved was closely coupled to the work of colleagues through the professional links that permit scientists to exchange ideas. Access to ideas makes all the difference" (1989, p.205). Good programmers write code that makes good use of other pieces of existing software, and that is easily comprehended and reused by other programmers. Where

this requirement is implicit in most scholarly pursuits, it is far more formal in the world of programming. Part of becoming a programmer is learning the formal processes and structures by which programs come into being. Equally important is an understanding of the culture of programming, of what makes hackers into hackers.

In 1973, the first version of "The Jargon File" appeared, and it has been maintained and updated continuously since then. The file collected the strange subset of language used by those who programmed computers as a way of life, of "hackers." The file is maintained by Eric Raymond, who is perhaps the central evangelist of hacker culture[7]. In its introduction, Raymond defines hacker culture as

> …a loosely networked collection of subcultures that is nevertheless conscious of some important shared experiences, shared roots, and shared values. It has its own myths, heroes, villains, folk epics, in-jokes, taboos, and dreams. Because hackers as a group are particularly creative people who define themselves partly by rejection of 'normal' values and working habits, it has unusually rich and conscious traditions for an intentional culture less than 40 years old (Raymond, 2001).

Although the Jargon File notes that "hacking" and "hackers" can apply to any field of study, hacker culture refers to the creating of computer code in particular. Code plays a central role in the life of a hacker, one that cannot be underestimated. The process of creating devices through discourse means that a great deal of emphasis is placed on how that discourse is conducted. Code extends beyond computer languages and

[7] Some of Raymond's efforts in this area should be taken with a grain of salt, because of his role as motivated booster of the "culture," because he never argues that his interpretation is unbiased, and because many of his ideas are far from universally accepted by those who consider themselves hackers.

written text, as discussed in the following chapters. The way in which computer professionals communicate has implications for a greater set of changes in society.

A culture consists of more than shared slang. Also important is a shared set of values, an understanding of what is important within the community. Indeed, the nature of open source projects has led many to question the motives of the community of programmers. It seems strange that the best programmers give away some of their best work for free, especially considering that many of them are self-admittedly egoists and many are interested in financial success. The success of open source has led indirectly to investigations of what drives hacker culture. A number of alternatives have been proposed, ranging from discussions of the gift economy and attention economy, to models of professional reputation similar to those in the academy.

At the root of such a discussion are questions of what individuals and communities of hackers hold to be important. If money does not drive them to create software, or even if it does, why is it that they engage in projects that by definition are unlikely to provide them with any remuneration. As economists Lerner and Tirole (2000) note, while the media may focus on altruism, very few open source adherents claim this to be their motivation. Moreover, that the software has benefited as many Fortune 500 companies as it has those in developing countries, a fact well known by those who contribute to open source, calls into question any altruistic motivations. Lerner and Tirole conclude that although open source may appear at first startling and

perplexing to the economist, there are rational reasons an élite programmer might choose to contribute to an open source project.

Two reasons for such participation are immediate. While it may seem as though the time spent on an open source project is taking away from paid work (or school work, or research), in fact the work done on open source projects may be helping the programmer solve an associated problem in her own work. Alternatively, the relationship might be just the opposite: if the experiences related by Raymond and Torvalds are any indication, the "open sourcing" of their projects was simply a spillover of work they were doing for their own benefit. In other words, the time spent on the project was not really an opportunity cost at all, the only cost was the presumed lost revenues. Because of the nature of the projects, because of the licensing arrangements of the code that they are built upon, because a commercial product would likely be met by an open source alternative, and because of the inherent risk of investing in the marketing and sales of such a product, the decision to turn it over to the open source community seems very rational. Add to this the possibility of getting other highly talented programmers to work for free on a project that meets the contributors' own needs.

A second immediate benefit Lerner and Tirole suggest is one not always associated with theorists of the dismal science: "a cool open source project may be more fun than a routine task" (p. 21). The "fun factor" is one often noted by

participants in such projects, even projects that seem to have little practical benefit. The thoughts of Yahoo! co-founder Jerry Yang about the reasons for starting the directory project echo a sentiment very familiar in Silicon Valley:

> You could call it a hobby, you could call it a passion. Call it instinct. But it wasn't really business. We weren't making money doing it, and we were actually forsaking our schoolwork to do it. In the end, it was sort of just the purity of the Internet, and its ability to influence tens of millions of people very rapidly that got us really, really jazzed about doing what we were doing. (Quoted in Postrel, 1998.)

Similar reasons were cited by those engaged in the "mundane but necessary task" of supporting the software by answering questions in public forums (Lakhani & von Hippel, 2000). Although the altruistic value of helping others enters into the process, many of those who frequently answered software-related questions enjoyed the process of figuring out the problems and found the solutions educational for themselves as well.

To these two immediate motivations, Lerner and Tirole add two delayed benefits: the possibility of future career advancement and ego gratification. The authors relate both of these to the economic literature on "signaling incentives." Within the open source community itself, each of these have been suggested as motives. Raymond notes in "The Cathedral and the Bazaar" that ego gratification is common across similar voluntary organizations and even has its own term ("egoboo") in science fiction fandom. Torvalds, who inevitably gets asked this question in many of his interviews, suggests that much of his later success came because of attention

gained when he created Linux as an undergraduate[8]. Wealth has followed this fame, most recently in the form of a widely publicized position at Transmeta, and several of the companies who have started in support of Linux have given Torvalds shares of the start-ups. Naturally, a young Finish student could never have known the impact his work would have, but the urge to gain the respect of one's peers is clearly not unique to Linux, nor to any open source project.

In classifying these needs, many settle on a basic set. In his book, *The Hacker Ethic*, Pekka Himanen (2001) attempts to reduce these motivations to three, which map roughly to Steve Wozniak's "food, friends, and fun." Himanen ties these motivations to a distinctive pre-Protestant work ethic. At the lowest level, Himanen argues, hackers need to obtain the basics of existence. In order to do this, they may work very hard to earn enough money to be independent of control. A relatively large number of computer professionals work as independent contractors, and among those who are frequent contributors to open source projects, that number is even higher. Hackers do not hold the work itself in particular esteem, and chaff at work that seems inefficient, redundant, trivial, or uninteresting. They also eschew many of the rules that are traditional for the workplace. During the last few years, during which there

[8] Stallman has been accused by some as being too ideologically motivated in his approach to software, though it is not clear that his ideas were ever intended to extend beyond the distribution of software. While the media may overemphasize the altruistic element, many in the community do feel strongly that there is something morally correct about encouraging the spread of knowledge. In an interview with TechTV, Torvalds indicated that intellectual property is a destructive idea—destructive to commercial concerns and not just to social concerns (Godoy, 2001).

has been a shortage of programmers to fill the demand, flexible hours, free pizza, pets at work, and foosball tables were *de rigueur*. They are not, however, as a rule, opposed to profitable work.

The need for social interaction might come as a surprise as it runs contrary to the stereotypical view of the hacker as introverted. In general, hackers are undersocialized, but do enjoy keeping company with likeminded individuals (Raymond, 2001). As a result of the internet, hackers can work in more remote areas, and those who work on Linux are surprisingly geographically distributed. Naturally, conversation among these groups tends toward the technical, but there is also a great deal of shared background and interest. Many read science fiction, especially cyberpunk, and are interested in physics and astronomy. They tend to enjoy a particular form of dry sarcastic humor.

Of these three elements, perhaps the most important is that hackers are bound by a love of programming. They consider the process of creating a program to be something that is inherently interesting, challenging, and entertaining. They see it as a craft that combines both strong technical knowledge, problem-solving abilities, and an appreciation of "elegant" solutions. Without a passion for the process of creating these solutions, one cannot be a hacker. More than any other element this is shared among hackers and is *sin qua non* of Raymond's definition of "hacking." It is also what differentiated the early hackers from others who used computers. Many who program

computers think of the process of creating a program as a means to a specified end. For hackers, the process of creating and altering the program is its own reward. This drive to create and solve intricate problems leads to many of the other characteristics that are associated with the culture: engaging the intricate fantasy worlds of science fiction, decontextualized and symbolic forms of humor, and a view that places authority only with those who demonstrate a strong command over systematic forms knowledge.

The last of these is worthy of noting. During the 1980s, when computer security for the first time came into the eye of the larger public, the word "hacker" was used to refer to those who illegally broke into computer systems. In response to this, those within the hacking community proffered "cracking" and "crackers" as alternative terms. This has never caught on in the mainstream media, though the difference is usually honored within the computing community. There are several reasons the terms may not have appealed to journalists. Perhaps chief among these is that the differentiation is not as clear as many hackers make it out to be. Many hackers, for example, make a distinction between malevolent and benign forms of cracking. Hackers routinely challenge their own security systems to ensure that they are viable, and since these systems often rely on the security of other systems to which they are connected, they often check outside security as well. Many have ideas about knowledge—specifically, as Stewart Brand (1987) famously put it, that "information

wants to be free"—that can come into conflict with structures of authority. Perhaps some of the sensitivity about the word is because the line between hacker and cracker is not always a clean one, and that it is somewhat displaced from mainstream ideas of the appropriate use of computers.

This fuzziness between hacker and cracker is reflected in other areas as well. Hackers are known to be fierce individualists, in everything from their dress to their politics. They value the ability to create elegant solutions to problems, solutions that do not require intervention. Arbitrary rules can strike some hackers as illegitimate, particularly when they are related to information systems. Clearly, the most elegant solution should prevail, no matter who develops it. The eight-to-five work day, systemized project management, and other trappings of the corporate world tend to be given far less credence than the ability to rapidly and effectively solve interesting problems.

Part of the process of creating elegant solutions is making sure that as much knowledge as possible is widely available. The *Jargon File* (Raymond, 2001) defines the "hacker ethic" in part as "the belief that information-sharing is a powerful positive good, and that it is an ethical duty of hackers to share their expertise by writing open-source code and facilitating access to information and to computing resources wherever possible." This is what lies at the center of Raymond's comparison of the "Cathedral," software production that is kept private, in-house, and restricted, and the

"Bazaar," the radically open form of development that is used to create and improve Linux. Himanen suggests a better analogy is the difference between the Academy and the Monestary. Following Merton (1973), he argues that openess is both an ethical necessity and a pragmatic approach to discovering new knowledge in the university system. Both hackers and scientists, he argues, have allowed the network approach to research and development simply because it works better than hierarchical models. The Monastic ideal, which would eventually become the model for the protestant work ethic, involves clear hierarchies, a devotion to hard work, and clear deliniation of time and activity. Mass production (of goods, services, or ideas) may work well in a system that adheres to bureaucratic structures of control, but free thought requires free association of both ideas and people. The communicative environment of open source yields more elegant solutions, Himanen argues.

Some may claim that the hacker culture does not apply to most computer professionals. Of course it is a myth, in the way that all cultures are myth, but it is one difficult to avoid as one becomes familiar with computer programming. While the number of direct contributors to open source projects may only number in the tens of thousands (Ghosh & Prakash, 2000), as compared to the millions of working computer professionals, the ideals of software exchange are far more widespread. Many programmers see an open source project as an eventual goal as they gain more expertise. Others might suggest that while the hacker culture may have thrived on the

early internet, it has been decimated by the new commodity network (Waldrop, 1994). But the values of the hacker are still seen as universal values for good programmers and contributors to the computing community. Even Microsoft, to many the antithesis of the hacker ethic, claims that "no PC software company has done a better job of keeping some basic elements of the hacker culture while adding just enough structure to build today's, and probably tomorrow's, PC software products" (Cusumano and Selby, 1997). The mantel of hacker culture, and the values it professes, affects computer professionals at every level, and is for this reason alone worthy of study. Beyond this profession, the ethic of the hacker is beginning to be spread beyond the more traditional hardcore coding community to other computer professions.

Open Source News and Information

As Himanen's analogy suggests, open source is not a kind of software, but a kind of social organization. While the ethic of openness was a part of hacker culture from the early 1960s, it was not until the internet explosion in the early 1990s that open source could leap from the isolated communities on the campuses of a handful of universities to many people's living rooms[9]. The spread of the internet enabled increasing numbers to engage in open source projects. The asynchronous, networked nature of the medium has had both successes and failures in more hierarchical

[9] This is only a partial overstatement. Alan Cox, for example, who wrote important networking components of the Linux OS, did so from his home in Wales, where he still works.

organizations. However, it has provided fertile ground for growing networked communities.

Naturally, the idea of creating software in an open source environment has led to other open source projects related to the internet. These emerged from communication systems initially intended for use primarily by those engaged in open source projects. *Freshmeat.net*, for example, "makes it possible to keep up on who's doing what, and what everyone else thinks of it" by linking to descriptions of current open source projects, discussion lists related to each project, and the latest version of the software to download. The Linux Document Project and the Linux Rute Users Tutorial and Exposition[10] are each projects intended to provide clear documentation for new Linux users, and unlike the hundreds of books available that provide this information, do so as an open source project.

The idea of opening the source and undermining the idea of an author has spread to many areas not directly associated with programming and software development. The *Dmoz.org* site, for example, is an open source version of an edited directory. Like *Yahoo!* sites are checked and categorized by editors. Unlike *Yahoo!* these editors are volunteers, working in their own fields of interest. The project emerged as part of the work Netscape was doing on Mozilla, an open source web browser. *Everything2.org* is designed as an encyclopedia of everything. Turns of

[10] *http://www.linuxdoc.org/* and *http://rute.sourceforge.net/*, respectively.

phrase, poetry, stories, and other ephemera are contributed and linked in a dense network. A more scholarly attempt at an encyclopedia is being undertaken at *Nupedia.org*, along with its less restrictive cousin *wikipedia.org*. The OpenLaw site at Harvard University[11], explicitly "building on the model of open source software," organizes information and ideas on legal and policy issues as a collective project, and MIT recently announced that they would provide open access to the content of course-related materials over the web[12]. In less academic pursuits, an emerging group aims to produce copyright-free roll playing games[13]. All of these are "self-organizing" in various ways. All are created and edited by a large number of contributors, though each has different ways of distributing editorial control. All provide licenses that fit the open source definition.

Some of the more vociferous arguments about open source have occurred in the field of biology. Especially those working in genetics fear that commercial interests could segment the research community and impede both research and the distribution of knowledge. As one geneticist noted, "we can't afford the equivalent of a biological Microsoft" (Philipkoski, 2001). Concerned with the lack of access to journals, over twenty thousand scientists signed a letter indicating that they would boycott journals that did not provide free internet access to articles ("Publish Free,"

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[11] OpenLaw can be found at *http://eon.law.harvard.edu/openlaw/* .
[12] See *http://web.mit.edu/newsoffice/nr/2001/ocw.html*; also Newmarch, 2001, for a discussion of Open Source and course materials.
[13] See *http://www.ps.uci.edu/~jhkim/rpg/copyright/opengaming.html*

2001; *http://www.publiclibraryofscience.org/).* Others have suggested not only the desirability, but the inevitability of open-source approaches to biology (Carlson, 2001).

When journalism first came to the web, the future was expected to be some combination of filtered newspapers that personalized content—the "Daily Me," as those at the MIT Media Lab have called it for many years (Negroponte, 1995, pp. 152-154; Brand, 1987, pp. 36-39) and journalistic upstarts like Matt Drudge (Shapiro, 1999, pp. 133-141). The current trends are much more interesting. Not only the dissemination of news, but the collection of news has been democratized by many on the net. A handful of journalists have been at the cutting edge of this, and have experimented with open source journalism, with varying degrees of success (Moon, 1999). At a very basic level, this wish to participate in *making* the news can be seen in the amazingly popular activity of keeping an open diary on the web. Web logs, or "blogs" as they are commonly called, provide daily diaries of thousands of people and are growing quickly. Users provide surprisingly candid accounts of their everyday activities, along with links to what they have found to be interesting, and friends and visitors are able to comment on these writings.

A number of these blogs are more collective in aim, using members of the community as sources of information and as amateur (or professional[14]) journalists.

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[14] See, for example, *http://www.andrewsullivan.com/*, *http://web.siliconvalley.com/content/sv/opinion/dgillmor/weblog/*, and *http://www.poynter.org/medianews/* .

The resulting sites, while they may not have the popular reach of mass media outlets, tend to attract a highly influential readership (Raphael, 2001). The blog model has been taken up by organizations as well as individuals; it is, for example, the basis of the Independent Media Center (*http://www.indymedia.org*) which was set up during the Seattle WTO Protests to provide news on events that the mainstream press would not or could not report. Each of the centers collect stories written and submitted by the public to post on the site. *Plastic.com* remains much truer to the "blog" format, by collecting information from elsewhere on the net for readers to comment on and discuss.

This format was made successful by the Slashdot website, which began in 1997 as a site devoted to providing "news for nerds, stuff that matters." It now has over 400,000 registered users (one need not be registered to either view or to post to the site) and serves about one million pages a day, according to the Slashdot FAQ[15]. The rise in popularity of the site was meteoric, especially considering that it did not advertise on the web or in other media. Individual users may suggest news or information they find on the web as being of possible interest to the board. Every day, editors select some of these stories, on rare occasions as many as twenty, and post them to the web site. Some content is original—reviews of books or films, essays,

[15] Due to differences in metrics, a point of comparison is difficult to find. Media Metrix (*http://www.jmm.com*) reports that the combined *New York Times Digital* properties received 6.7 million unique visitors during the month of April, 2001. A rough estimate might place this at an order of magnitude higher than *Slashdot.com.*

interviews, features, or "Ask Slashdot" questions for the community—but most are short notes about news or information found elsewhere on the web.

Slashdot acts as a filter for information and news on the web. Like any newspaper, they often reference stories already uncovered by other news sources. Links to stories in the *New York Times*, on News.com, or on ZDNet are common. Slashdot is also getting a reputation for scooping the major news organizations. When this occurs, a Slashdot story might consist of a hyperlink to the website of a start-up company or a university research lab. Within the next couple of hours, all but the most powerful of these smaller servers are overwhelmed by hundreds of thousands of users. As a result, many of these systems shut down, unable to handle the 15 minutes of fame. This process, dubbed the "Slashdot effect" by users of the site, has now spread into the common parlance of the web. People now speak of the Slashdot effect any time a web site suffers from sudden fame, whether or not Slashdot was the site responsible[16]. The audience drawn by the site is tremendous, and the format leverages these users to create a collective news-gathering service that rivals any on-line media giant.

Rob Malda, one of the founders of Slashdot, has claimed on a number of occasions that he does not see himself engaged in a journalistic pursuit. This has not stopped others from claiming just the opposite. An article in *Time Magazine*

[16] An article on the crush of web traffic to earthquake research stations following an earthquake, for example, is covered in a short article called "Web Servers, Earthquakes, and the Slashdot Effect" (Schwarz, 2000).

(Grossman, 2000) concluded “Goodbye Peter Jennings. Hail, Commander Taco.” (“CmdrTaco” is the nickname Malda uses on Slashdot, his *nom d’informatique*.) Others have not hesitated to note that Slashdot engages in a kind of “open source journalism” (Hamm, 1999). Others agree with Malda and argue that Slashdot is not, for various reasons, a journalistic enterprise. Some journalists claim that the heavy reliance on other news outlets to provide fodder for discussion demonstrates that the site is not really a “source” of news. Others say, in a seeming contradiction, that the site serves as a kind of tip-sheet for journalists. Another issue that is inevitably introduced is the reliability of the information. Neither the editors nor the discussants make any pretense at being unbiased, and it is unlikely that you will find stories that adequately reflect, for example, Microsoft’s side of any issue. As one journalist has noted, “people go to sites like Wired News and PC Week because they have this curiosity for the truth and this underlying belief that services [like Slashdot] don't always get it right, and they need an independent verification” (quoted in Glave, 1999). Finally, it is difficult to find an authority on the site. Links to official notices on other sites exist, but the commentary itself is anonymous, or at most pseudonymous.

Others argue that the mass anonymity of Slashdot is exactly what makes it a trustworthy site. Priestly (1999), suggests that many already distrust news in the mass media, yet are forced to rely upon it. Professional news outlets, online or not, are susceptible to problems with reliably reporting events. Slashdot provides an

alternative, one in which a mass of people all work toward collective filtering of news. Priestly (coincidentally, a Microsoft employee) acknowledges that the contributors to such web sites are not representative of a larger public, but "when a site achieves a certain level of notoriety, Slashdot for example, a cross-section of users may fairly be said to represent its supporting community, in this case idealistic geeks." Certainly, judged by conservative views of the ideals of professional journalism, Slashdot does not fit. In part, no doubt, it is because it does not fit that it has met the needs of the nerd niche so well. For those in search of alternative news, especially news from a particular political or ideological perspective, the blog provides a way of filtering information for the tastes of a particular community. Perspectives that match those of a community, but may not be represented in the mainstream press, have the opportunity to turn their members into a distributed news-gathering machine.

Slashdot

Figure 1-1 provides an example of the top of a typical Slashdot post, in this case news of the release of a new version of the GNOME desktop environment. The masthead and (a) a set of topic icons[17] appear at the top of the page. The icon for this topic, consisting of the GNOME logo, is listed next to the article. The main posting is

[17] The icons shown on this page represent the following topics, left-to-right: USA, Microsoft, Internet, Space, and Money. The icon used for Microsoft, Bill Gates's visage modified to appear like the Borg, a "collective" in *Star Trek* that is known for saying "you will be assimilated," is often mentioned in accounts of Slashdot in the mainstream media.

quite short, and provides (c) commentary by the person who submitted the news item, Elliot Lee, (d) hyperlinks to sources of the information, and (e) further comments by the editor, Justin. As noted above, there is a considerable amount of original content on Slashdot, but these notes referring to other news on the web are the central attraction and receive the greatest number of comments.

What makes Slashdot different from sites that rely upon legacy media for their structure—CNN.com or NYTimes.com, for example—is the primacy of feedback. While the site does provide pointers to other information elsewhere on the net, its main function is to serve as a gathering place where information on these sites can be discussed. Many of the news and information sites referenced in Slashdot postings have their own mechanisms that allow users to respond or to discuss an article. Slashdot, however, provides articles from a particular perspective, and provides a certain collective narrative continuum across these articles.

The site also provides a way to sort through the broad range of comments that are provided. A speech on Microsoft's proposed alternative to open source, what they are calling "shared source," met with over a thousand comments in the hours that followed the story's posting on Slashdot. Many of these comments are not particularly insightful. In order to make sure that the most newsworthy comments are easy to find, editors began in the early stages of Slashdot by moderating the comments, ranking the

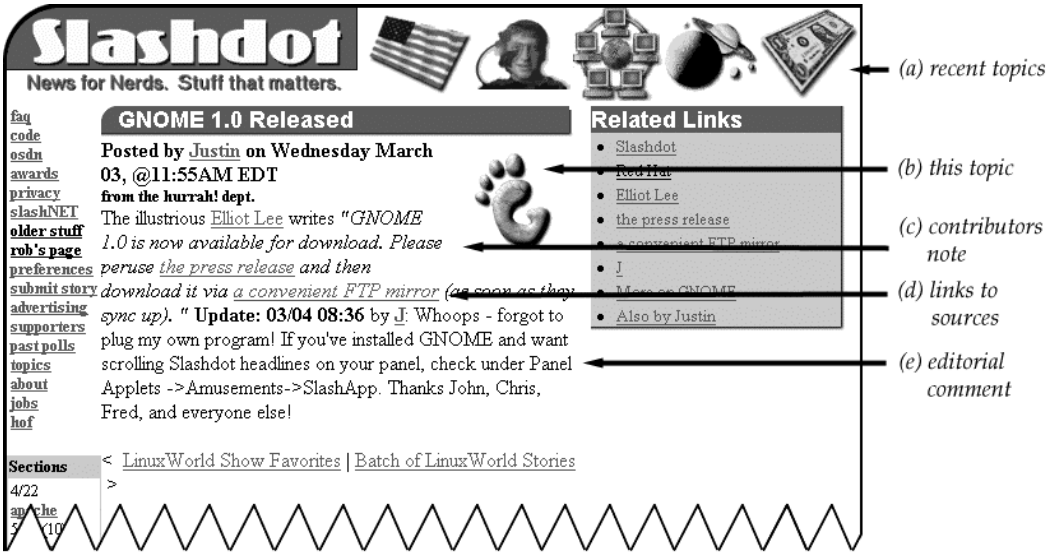

Fig. 1-1. Top portion of a typical Slashdot post. Source: http://slashdot.org/articles/99/03/03/1555244.shtml.

better ones up and the less useful down[18]. As Slashdot grew, the number of editors increased to 25, then to 400, at which point the process of moderation (and managing moderation) became onerous.

The designers of the Slashdot system recognized the need for some form of moderation. They were looking for a system that would meet the following goals:

1. Promote quality, discourage crap.
2. Make Slashdot as readable as possible for as many people as possible.
3. Do not require a huge amount of time from any single moderator.
4. Do not allow a single moderator a "reign of terror." (Slashdot FAQ)

The resulting system of moderation put the ability to moderate in the hands of those who read Slashdot. Any regular, registered reader might be given the ability to

[18] The material in this paragraph comes from the Slashdot FAQ, unless otherwise noted.

moderate the discussion board, and the honor is granted periodically to a registered visitor with good "karma" (more on this below). Each comment on Slashdot is ranked from –1 to 5, with 5 being the most worthwhile. While reading comments on a particular article, moderators are able to increase or to decrease the ranking of any single comment. To increase the ranking of a post by one point, they would mark it as *Interesting*, *Insightful*, *Informative*, or *Funny*, to decrease the ranking of a post they could mark it as *Offtopic*, *Redundant*, *Flaimbait*, or *Troll*[19]. You may also choose to rate up and down without comment (see fig. 1-3). The intent is that by distributing the power of moderation widely, and giving each moderator very limited power (they can only moderate a handful of comments each time), good posts will rise to the top. Users can then set filters so that they only see, for example, comments that have been ranked 3 or better.

Figure 1-2 provides an example of the first screen of comments on a particular topic. Note that the first two comments have been ranked as fives, and represent what a majority of moderators found to be valid critiques or comments. Note also that viewers are able to filter the comments they see by setting a threshold level. Setting this to three, for example, would eliminate the majority of posts, leaving a significant

[19] These last two might not be familiar to those who do not participate in online discussions. They are similar in meaning, and each are messages designed to elicit responses, either by posting something that is deliberately inflammatory, or deliberately including mistakes in a post, with the intent of encouraging others to respond. (More details can be found at *http://www.whatis.com*, or Raymond, 2001).

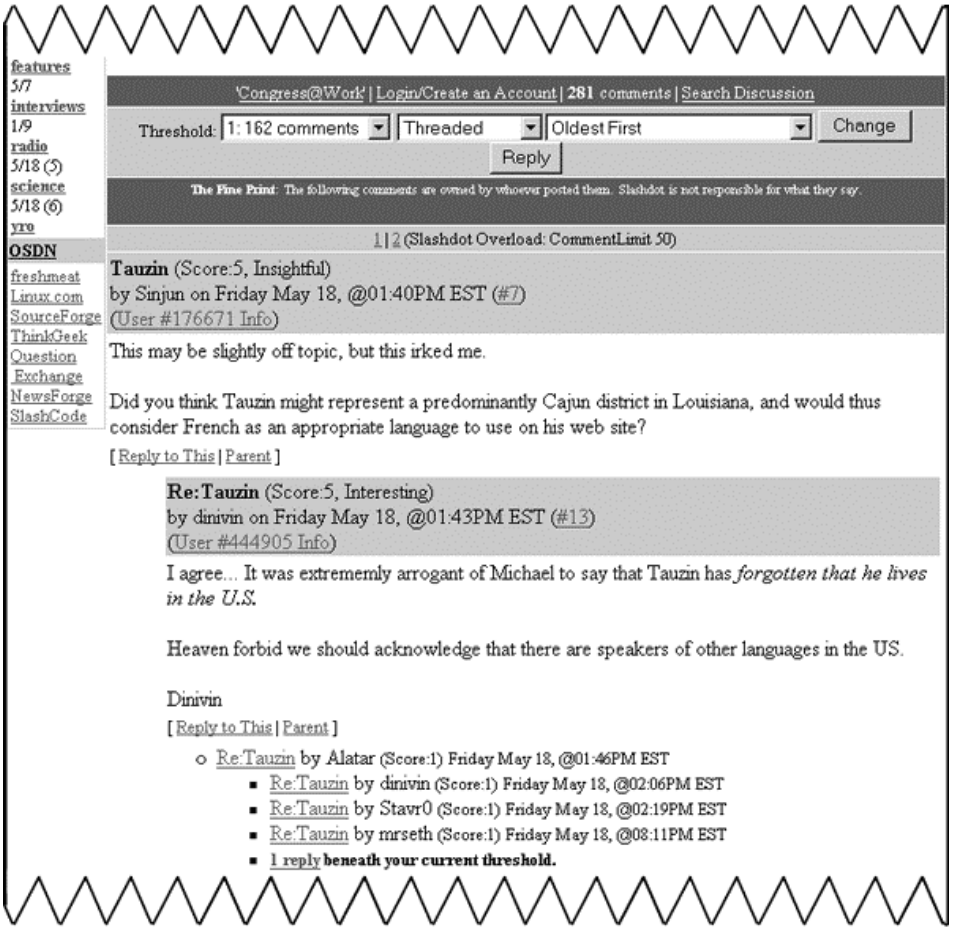

Figure 1-2. Sample from comments section of a typical Slashdot page.

number of good responses. Figure 1-3 demonstrates a portion of a typical topic for someone who has been granted the power to moderate.

On top of this relatively simple system of peer review, exist two further elements: "karma" and meta-moderation. Those who regularly post good articles (that is to say, articles that are regularly "modded up" by their peers) increase the amount of their karma. This karma can be used to increase the initial rank of a comment by a

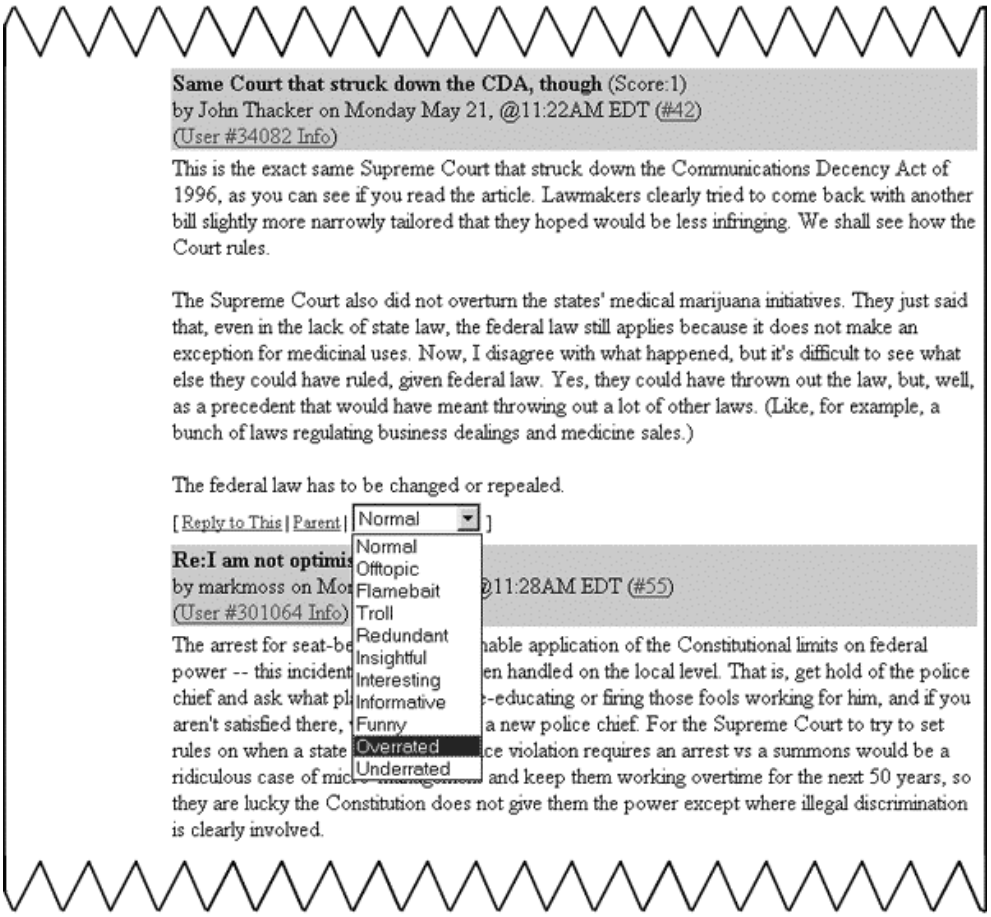

Fig. 1-3. Typical Slashdot page when being moderated by the user.

contributor who has been appreciated in the past, or in the case of low karma it can create barriers to those who have posted valueless material in the past. Note that no individual user is banned from the discussion, they are simply relegated to a kind of purgatory for posters. Their initial posts are at the –1 level, and it can be difficult to rise above this. High karma also affects the likelihood of being made a moderator.

Some moderators are able to moderate the selections of other moderators. This is referred to as M1 for moderation, and M2 for metamoderation. Metamoderators perform a job similar to that of moderators, and mark moderators selections as to how "fair" they are. Like moderators, metamoderators are picked at random from the registered users of the site, as long as they not among the most recent 10% of new registrants.

The reasons for the success of Slashdot are difficult to gauge. The number of sites that have followed similar models of organization and moderation would indicate that the balance between the rule of the user and the authority of the editor that has been written into the system can be useful elsewhere; as the FAQ for Plastic.com explains, this approach operates "somewhere between anarchy and hierarchy," as a "live collaboration between the Web's smartest readers and the Web's smartest editors." There are two other factors that might explain the popularity and diffusion of the format. First, Slashdot (naturally) made the source code that runs their site available to anyone free of charge, allowing for hundreds of sites that now look and work very much like Slashdot. The fact that a free system is already written and tested fails to explain, however, why very similar systems have since been designed in a variety of languages and formats (see, for example, *http://squishdot.org*). And those who do use different systems of moderation (kuro5hin.org or everything2.org, for example) retain many of the key elements of the Slashdot approach, like peer

moderation and karma. Another possibility is that, given the large viewing audience of Slashdot, the format of this pioneer of collective blogs might be familiar to users of newer sites. But it seems that in large part, it is the nature of the interaction on the site that makes it the template for blogs across the web.

An article in the *Irish Times* provides a good thumbnail sketch of the Slashdot site:

> The site, www.slashdot.org, attracts a set of fine, unfettered minds and a high volume of intelligent, irreverent and often highly amusing postings on a formidable range of topics. Slashdot also attracts more than its share of programming extremists, misanthropists more in love with their machinery than the human race, and paranoid conspiracy theorists (usually ranting about the company they believe to be Evil Incarnate, Microsoft). But that's exactly what makes the site one of the best going, if you are a tech fan. It's great for programmer-watching, and they can be a pretty interesting species. (Lillington, 2000).

Summary

This chapter has introduced the idea of open source, how this might relate to a hacker ethic, and the Slashdot web site itself. These elements make up the technological complex of Slashdot. As such, they each shape the structure of content that works its way through the Slashdot system. A better understanding of the bias of newspapers can come with an understanding both of the technological restrictions of the medium and an understanding of the ethics and history of the profession of journalism. Likewise, by examining the ideals of the open source movement and how this interacts with the structure of the Slashdot website, we are in a better position for

determining how this might affect the news and conversation that occurs at the site. In the next chapter, we will explore the degree to which computer professionals and journalists share an even wider affinity; if Slashdot is any indication, computer professionals may be in a particularly good position for encouraging the creation of new public spaces for deliberation in an information age.

Chapter 2:

Computer Intellectuals

> Computer professionals, as founts of knowledge, skill, and innovation could be key agents in the redirection of communication technology to democratic ends.
>
> – Doug Schuler (2001)

The archetypical nerd is often seen as anti-social. At the extreme, some have suggested that the computer sciences tend to attract those who have a mild form of autism[1]. Others have noted that computer professionals are highly social, albeit in a different way: they remain in some ways separated from mainstream culture. Although their attitudes toward those who are not conversant with computer systems are often élitist—jokes about the ineptitude of users abound—they, in turn, remain looked down upon by much of the mainstream culture. As an increasing part of our work and social life begins to rely upon computer networks, it is important to understand what role computer professionals, and communities of computer professionals, play in the larger society.

As a whole, this dissertation argues that Slashdot represents not only an interesting technology for large-scale discussion, but a way of connecting that discussion to larger social and political systems; that is, that Slashdot represents a virtual public sphere. This chapter introduces in a little more depth the culture of

[1] Gary Chapman, in a 1999 *Los Angeles Times* article, suggests that the characteristics of "geekiness" are also symptoms of Asperger's Syndrom, a form of autism. This article and an earlier one were both discussed extensively on Slashdot (*http://slashdot.org/articles/99/09/13/1223215_F.shtml, http://slashdot.org/articles/99/09/27/1347213.shtml*).

hacking, with an eye specifically to what that might mean in terms of creating public "places" online. Many have examined the role of the technologist during the industrial revolution. This chapter argues that the computer professional of the network society plays a different part. Rather than creating and maintaining the machinery that enforces the dominant social paradigm, many technologists act as computer professionals, as a new form of journalist. Some of the messages they create, however, have more direct effects on public discourse than journalists could ever have imagined. It is important to recognize the influence they can have over public discourse, and to recognize the important function they can potentially perform in the service of democracy and in the preservation of a public sphere.

Nerds have been seen as socially awkward but relatively harmless; few recognize the power they exert now, and the growth of that power over time. In the past, there have been concerns over the degree to which technologists may gain social power. We should be concerned about this possibility in the case of computer technologies, but we should also be aware of the potential place they can have in providing for greater social justice and influencing public policy. There is already a strong shared ethic among many computer professionals, informed by a hacker ethic that stretches to the earliest days of the technology. The question is what form this might take as more and more social discourse takes place over computer networks.

Information Technology and Social Change

Informal organizations are progressively becoming less bound by space and time, thanks in part to a growing network of computers and other communications devices. The "network society" described by Castells (1996) relies on a set of relationships between people at a distance. There remain natural isomorphisms between geography and social networks, of course, and indeed these will continue to be closely tied, but increasingly social interaction is mediated by converging networked communication technologies. This is particularly true of informal organizations, sodalities that form outside the reach of traditional institutions. As these organizations come to rely more heavily on new forms of media, it is vital that we question how these media affect the social structure of informal organizations, and what impact this has on discourse within the public sphere.

Civil society is often described as the "middle ground" between the state and the market. Some claim that the concept of civil society was little more than a popular academic fad that occurred during the two decades following the translation of some of Habermas's influential work (Wolfe, 1997). During the same period, one of the most active areas of research on the internet has been the idea of the "virtual community"—communities that are mostly or entirely mediated by computer networks. Howard Rheingold popularized the term in his 1993 book *Virtual Community: Homesteading on the Electronic Frontier*. There has been a significant

amount of controversy over how to define the "virtual community" and whether a community can be virtual at all. The book itself does not settle upon a fixed definition, and more recently Rheingold (1998) has said that he answers the frequently posed question of whether virtual communities are "really" communities by saying that they are not really communities, but that the question of what makes them communities or not is a worthy area of investigation. He goes on to suggest that "we definitely need to be skeptical of claims that online discourse can effectively substitute for or revitalize the traditional public sphere." That in a period of five years someone who was among the greatest boosters of networked communities now finds their promise much more limited is both surprising and indicative of many of the views among observers of the new media.

That technology can have some effect on social interaction is rarely debated, and the degree to which it exerts such an effect is rarely agreed upon. At the extreme end of the spectrum (and while extreme, also very popular) is a view of media determinism that often finds its roots in Marshal McLuhan, who *Wired Magazine* declared their patron saint. The view of these technophiles, and the many popular commentators who have followed them, is that technology, and especially the internet, leads to a more liberated, democratic, and communal society. The technology is not seen as a neutral tool, but as the material manifestation of progress. In *Understanding Media* (1964), McLuhan puts it thusly:

> The restructuring of human work and association was shaped by the technique of fragmentation that is the essence of machine technology. The essence of automation technology is the opposite. It is integral and decentralist in depth, just as the machine was fragmentary, centralist, and superficial in its patterning of human relationships. (p. 23)

Those who hold this view often feel that progress has been exponential, and is, among the most extreme in this group[2], seen to be approaching a "singularity," an asymptotic technologically-driven utopia, the end of history. Further, many still believe in an "essence" of networked computer communications, one that leads inevitably to democracy and freedom. This comes through in recent works in "medium theory" that address the social changes that will inevitably follow the introduction of internetworking (Levinson, 1997; Couch, 1996).

The information revolution is more than the industrial revolution, it is a revolution that will continually renew itself, leading to continuous improvements in the social welfare. This is the view presented in "A Magna Carta for the Knowledge Age," which appeared in the early 1990s (Dyson et al, 1995). Even in those heady days, the claims made by some of the more well-known "Third Wave" prognosticators seem like a caricature of technological determinism. It at one point suggests the inevitability of a new, massively decentralized libertarian networked society: "Living on the edge of the Third Wave, we are witnessing a battle not so much over the nature of the future—the Third Wave will arrive—but over the nature of the transition." Soon

[2] The extreme end of technological determinists are likely the posthumanists and extropians (see *http://www.extropy.org*), and related writings by, for example, Daniel Hillis (1995), Ray Kurzwiel (1999), and Hans Moravec (1988).

after the publication of the "Magna Carta," it became clear that the predicted ascendant Asia was not forthcoming in the short term, and more recent economic failures in the technology sector make clear that the "Third Wave" is affected by the same economic rules as the "old" economy, after all.

These technology pundits can be "entertaining, provocative, and timely," but rarely provide the kind of deep understanding of the issues that is required to effect real change or to make a reasoned assessment of how technology affects those who use it and are used through it (Kling, 1999). Those critical of the new communication technologies—or, more often, critical of naïve attitudes toward the introduction of such technologies—may not be as visible on the newsstand, but provide a significant body of work. Critical scholars often turn to previous communications "revolutions" to show that hype often outshined the reality, and that these technologies at best led to superficial ameliorations of social conditions, and at worse reinforced already-existing social inequities.

History suggests most communication technologies tend to serve the interests of those who are already in power. The present "revolution" they argue gives little indication of being different. Certainly, Beniger's *Control Revolution* (1986) fits this pattern. Beniger relates information to control, then links this to the advancement of hierarchy in society over the *longue durée*. The assumption is that disruptions of this increasingly centralized control are insignificant and temporary. Herbert Schiller

(1995), for example, argues that the computer simply reinforces the position of the United States within the global system as the source of news and information, and consequently as the global arbiter of truth and value. Many of those who first began to look at the influence of computerization on social structure found that social inequities are self-reinforcing, and that computers, whether intentional or not, provided a "means for extending the control of man over man" (Boguslaw, 1971, p. 431).

Additionally, some critics argue that the introduction of the internet threatens our conception of reality. These critiques range from the very practical (e.g., Slouka, 1995; Woolley, 1992) to the more theoretical. At issue is the loss of authenticity, of the increasing separation between the symbolic virtual world and the actual world. Postman (1993) and Shenk (1997) claim that the information age, recalling Goethe's "Sorcerer's Apprentice," replaces a paucity of information with a glut. However, they each argue that information is not the same as knowledge, and the flood of information creates an artificial need for even more technology.

Langdon Winner (1991) provides a clear refutation of the idea that information and democracy are inexorably tied in his essay entitled "Mythinformation." He defines mythinformation as "the almost religious conviction that a widespread adoption of computers and communication systems, along with broad access to electronic information, will automatically produce a better world for humanity." He argues that "computer romantics" have made inflated claims regarding the benefits of information

technology for the spread of democracy. He writes that such claims are based on four assumptions: that "people are bereft of information, information is knowledge, knowledge is power, and increased access to information enhances democracy and equalizes social power." Winner indicates that this successive syllogism leaves aside the most important elements at each step. People, for example may better avail themselves of knowledge in a public library than on computer networks, and information—especially in the form of raw data—is a far stretch from knowledge[3]. Most importantly, even if information is distributed and knowledge obtained, this is not the primary component of democracy. It is equally possible that the citizenry will be well informed but apathetic, or that the mechanisms of government will continue to exclude informed citizens.

At a conference in 1999 on the global city in the information society, one respondent noted that all but three papers at the two-day conference cited one or more of the three books in Manuel Castells's *Information Age: Economy, Society, and Culture* trilogy. Perhaps Castells has thus far escaped harsh criticism because he does not ascribe the social changes underway entirely to new technologies. On the other hand, his argument for the preeminence of a new "network society" would be significantly weakened if not for the explosion of networked communication devices.

[3] That a public library is a better expenditure than a connection to the internet remains an open question, though it certainly was not as uncertain at the time the essay was written. Given the expense of stocking a good library, and the increasing availability of similar materials over the web, it may be that a computer network would be as valuable as a library. This does not change the heart of Winner's critique, which is that equating information with knowledge misses something vital.

Castells concludes the first volume in the trilogy, *The Rise of the Network Society*, by commenting on the structure of social systems he has presented:

> …as a historical trend, dominant functions and processes in the information age are increasingly organized around networks. Networks constitute the new social morphology of our societies, and the diffusion of networking logic substantially modifies the operations and outcomes in processes of production, experience, power, and culture. (1996, p. 469)

As he continues to describe the concept of the network, he introduces both familiar elements (that it is a system of nodes and connections of various strengths, for example), and some characteristics that are by no means universal to all networks, including dynamic instability, easy expandability, and decentralization. That *more* networks are present in some societies or at some times than at others is a somewhat confusing claim. The network is not an *a priori* characteristic of social interaction. It can be an effective way of studying, modeling, and explaining social interaction, but the network is cognitive construct, not an emergent property. Castells admits that networks are not unique to the "network society" but fails to recognize what others have, that the *properties* of these networks are of interest, not their existence.

The use of networks to describe social systems is not a particularly new idea. Georg Simmel examines the question of social relationships in many of his works, and more specifically networks in his essay "The Web of Group-Affiliations" (1955).

Simmel also sees individuals as existing within a network of relationships[4], but that these intersecting networks have always existed. There were two general categories of groups to which an individual might be affiliated, which he described as being "*terminus a quo*" and "*terminus ad quem*." The former groups are those typified by the family, into which a person is born or naturally belong (imbued with Heidegger's "thrownness"—that is, something that seems to the individual to have always been a group affinity), while the latter are those affiliations that individuals choose to become a part of. Simmel's contention is that affiliations of choice are gradually overtaking those affiliations of traditional society. To invert Haeckel, in the case of social networks, phylogeny recapitulates ontogeny. As individuals, we begin as undifferentiated members of a family and a town, but as we grow older, we may choose to affiliate with less familiar and geographically bound groups; expressing our individual identity in our choices of association. Simmel sees this process occurring at the social level as well; "as the development of society progresses, each individual establishes for himself contacts with persons who stand outside this original group affiliation, but who are 'related' to him by virtue of an actual similarity of talents, inclinations, activities, and so on" (p.128). In contrast to Castells's view of the network as a discontinuity, Simmel (following Tönnies) sees flexible and

[4] In the terminology used by Simmel, at the "intersection of social circles." The translator of this work replaced many of the references to social circles with group-affiliations, as he saw it as a clearer description of Simmel's ideas.

interpenetrated groups of affiliation as growing in influence, but contiguous with earlier, more traditional networks of affiliation.

To understand how Castells came to the concept of the network society, it is valuable to trace its development from an earlier work, *The Informational City* (1989). As an urban scholar, Castells approaches the network society as an urbanity without spatiality. When he writes of "hubs" and "switches"—confluences of information flows—they clearly reflect his earlier views of the global city. In *Network Society* he shows that those who are at the center of these confluences and control the flow and distribution of information are the new power élite. This corresponds with a class that exists in a new, transnational global metropolis. As Sassen (1991) has noted the "global cities" now represent a network that is abstracted from its constituent geographic distances[5]. The result is a new, interpenetrated complexification of the structures of power and control, reifying an élite monoculture while pushing a sea of diversity to the exploited margins (Mattelart, 2000). The structures that have traditionally been geographical, and which were patterned on the economic advantages of the industrial city, are gradually giving way to information advantages. For the most part, those who have always been in control of material production continue to be in control of information flows, though there have been some significant changes. Castells has been criticized for what seems like a very deterministic view of how

[5] In other work (Halavais, 1999), I have demonstrated how a map of hyperlinks on the world wide web replicates a tightly knit grouping of global cities; that, for example, web sites in New York are far more likely to link to a site in London than to a site anywhere in the southern United States.

technology shapes these flows (Webster, 1995). The argument presented in *Network Society* avoids presenting a simplistic view that networked communication technologies lead to networked social structure. Yet, beyond the suggestion that these structures "emerge," there is no clear indication as to why networks have come to be the dominant form of organization.

What are the characteristics of this "new" networked-orientation of society? Castells suggests that networks are "able to expand without limits, integrating new nodes as long as they are able to communicate within the network, namely as long as they share the same communication codes" (p. 470). This focus on need or goals is antithetical to the organizational needs of capitalism. That is not to say that capitalism has been superceded, but rather that it exists increasingly at the local level, while the new logic of information has more influence globally. The network structure is a "highly dynamic, open system, susceptible to innovating without threatening its balance" (p.470). These structures permeate not only business but cultural organizations, they also increasingly influence (though are somehow abstracted from) material exchange. Throughout his book, Castells indicates the ways in which computer networking supports these new social networks, though the emphasis is always on the technology fulfilling a social need.

As a theory of social change, the network society leaves much to be desired. The impetus for change (as in Simmel's work) is not made clear. The network

approach however is worthwhile. Communities as abstracted from geography, and bound increasingly by shared goals, are more likely to be able to make effective use of networked communication systems. The flexible group is increasingly based on the model of a rock group (Dryfus & Spinosa, 1997). For a while there is an intensive effort among a group of people, and as this effort dies off, another quickly takes its place. Such a model is becoming prevalent in business, as Castells demonstrates in *Network Society*. Although these geographically unbound networks may not adhere to our traditional view of the community, because participants work together, play together, and often share a set a values or morals, many feel they are at least as true to the communitarian ideal as geographically bound communities (Etzioni, 1993, pp. 121-2).

The flow of information within a socio-technological architecture is what unites Castells with Lawrence Lessig (whose ideas will be discussed below) and others who are interested in examining how the flow of information is shaped. The idea of a mass, one-dimensional society renders the concept of flow meaningless. In order to understand how information moves through a society, we have to understand how the paths it takes are structured and how they change over time.

It is all too easy to assume that cyberspace is somehow separate and unconcerned with everyday life. While there are many that remain *uninvolved* in the

new computing technologies, there are few that remain *unaffected*[6]. Though the threat of the Y2K bug failed to materialize, in part due to massive spending in order to make safe the most critical systems, it did point to the degree to which cyberspace now intersects with "real" space. Had the computers stopped on the first morning of the new millennium, those in the developed world, and especially in urban areas, would have been thrown into chaos. The convergence of telephone, television, and publishing networks continues to accelerate. As much of our world is ever more mediated by computer networks, it is dangerous to assume that it can somehow be segmented from our daily lives. As Andrew Shapiro (1998) has argued, "cyberspace" is disappearing, becoming intractably enmeshed with our wider social lives. We must recognize how intractably computer networks have become insinuated into our social networks and find ways to make certain the sources of control embedded within this technology remain open, transparent, and democratic. More than ever, those who control the machines have the ability to shape society.

[6] This is what is at the heart of questions of the "digital divide." The newly appointed FCC Chairman Michael Powell has recently commented to the effect that the digital divide is akin to a "Mercedes divide"—that just because someone cannot afford access to something doesn't make it a gap (see Bunker, 2001). Such thinking is indicative of a lack of understanding of how the internet might matter to democracy, and belies a severe blind spot from someone expected to help manage the channels of public communication.

Communication in the Public Sphere

What is the place of information and communication in a democratic society? The previous section briefly noted Winner's critique of a simplistic view that more information leads necessarily to better democracy. This idea is hardly a new one, and has been developed in several directions, especially over the last century. A common strand is found in many of these discussions. First, an informed citizenry is vital to a just democracy; second, an informed citizenry is the product of more than one-way flows of information.

The question at hand is whether computer networks are an extension of the mass media. There are certainly those who think that it could be successfully studied as such (Moris & Ogan, 1996). If it is a mass medium, many criticisms that it reinforces existing imbalances, rather than providing for greater participation, would be well founded (Weizenbaum, 1976). Americans are all exposed from an early age to Thomas Jefferson's ideas about information and education being necessary ingredients for a successful democracy. "Whenever the people are well-informed, they can be trusted with their own government. Whenever things get so far wrong as to attract their notice, they may be relied on to set them to rights" (Jefferson, 1903, v. 7, p. 253). In another oft-quoted letter, he then clarifies how this relates to the newspaper: "Nothing can now be believed which is seen in a newspaper. Truth itself becomes suspicious by being put into that polluted vehicle… The man who never looks into a

newspaper is better informed than he who reads them, inasmuch as he who knows nothing is nearer to truth than he whose mind is filled with falsehoods and errors" (Jefferson, 1903, v. 11, p. 225). The question is whether these views of education and the newspaper can be reconciled. Certainly, something can be learned from overheard facts, but since no negotiation over meaning can take place without discourse, the newspaper is doomed to be an organ of gossip. As Baudrillard (1988, p.208) puts it: "power belongs to him who gives and to whom no return can be made."

John Dewey is often remembered for his work in tying the mass media to political action. His work on newspapers and the "organized intelligence" of the nation (much of it influenced by a doomed collaboration with Franklin Ford on the "Thought News"; see Czitrom, 1982, c. 4) examined the ways in which newspapers could bind the mass population into a community and help them to understand and respond to social problems. Along with Robert Park, Dewey felt that newspapers could provide a deep understanding of the news, rather than sensationalizing events and providing only superficial investigation of their causes and effects. Though it is often this hopeful approach to newspapers that Dewey is remembered for, it should be recognized that this was in response to what he saw as the diminution of community, and with it of democracy. The mass media were, for Dewey, contributors to this dissolution of community ties, and therefore a useful target for reform. In an era of new media and other divertissements, interests "having to do with citizenship are

crowded to one side" (Dewey, 1927, p.189). Dewey was careful not to lay blame for this entirely on technology[7], but recognized that the mechanization of social life needed to be countered. The newspaper needs to present facts in their social and historical context, and allow for discussion of a number of viewpoints rather than obscure them with narrative endorsements of one view or another.

Many boosters of computer networks see them as an extension of the mass media. Some see the extension as the equivalent of putting a printing press in every home. Others see it as a customization of the news to the individual, the "Daily Me" touched upon in the first chapter. Certainly, the latter of these has the potential of forestalling public debate. That a customized newspaper would have the direct effect of ending public debate discounts, in some ways, the impetus people have for gathering news. Naturally, one use of news is to help guide day-to-day decisions, but the other is to serve as a grounding for discussions with others[8]. Some widely viewed television series, like *Seinfeld*, certainly owe part of their popularity to talk around the water cooler the next morning. One might envision a filtered news system that was used by those engaged in active deliberations to discover a spectrum of information on

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[7] "Only geographically did Columbus discover a new world. The actual new world has been generated in the last hundred years. Steam and electricity have done more to alter the conditions under which men associate together than all the agencies which affected human relationships before our time. There are those who lay the blame for all the evils of our lives on steam, electricity, and machinery. It is always convenient to have a devil as well as a savior to bear the responsibilities of humanity. In reality, the trouble springs rather from the ideas and absence of ideas in connection with which technological factors operate. Mental and moral beliefs and ideals change more slowly than outward conditions" (Dewey, 1927, p.141).

[8] I am referring here, of course, to Carey's well-known distinction between the news as transmission and as ritual.

the topics at hand. This, however, is predicated on the existence of such a forum, which is not the case for most Americans.

The World Wide Web is often seen as synonymous with the internet, and seen as bringing new opportunities to the world of political news. Yet much of this news is precisely the sort that Dewey was attempting to counter: social gossip and superficial narratives. An article on creating children's newspapers on-line, for example, suggested that children were more interested in the views of the article writer than in the hard facts and the context of the story (Evard, 1996). Much of the attention to political action on the internet has focused on web-based electoral information. The use of these media rarely moves beyond providing information that has traditionally been available in other formats. Sites like the Electronic Policy Network (*http://www.epn.org*), while good sources of specialized information, do not contribute significantly to a more participatory government. There are some innovative attempts to build political support during elections through more interactive means, but these have been the exception rather than the rule (Lewicki & Ziaukas, 2000). Web sites like the Minnesota "e-democracy" site (*http://www.e-democracy.org*) are touted as the cutting edge of the use of computers to create greater participatory democracy. While this site includes an effort to create email lists, this is auxiliary to the static portion of the site, which appears to present information that is already available in printed form. Of course, it may reach a wider audience by being made available over the web, which

is the basis of efforts like Project Vote Smart (Holdridge, 1998), but this change in penetration does not change the character of the information or its use. These and other efforts often tend more toward "e-government" and the rationalization of government services rather than improvements in the democratic process (see, for example, *http://www.cordis.lu/ist/*). These kinds of efforts lead to a greater homogenization of the information environment, and a continuation of the massification of the last century.

Many have recognized that the internet allows for an increase in the sources of news, for narrowly tailored news delivery, for interactivity with databases, and for one-to-one communications, and have commented on how they think this will affect democratic institutions (e.g., Abramson, Arterton, & Orren, 1988, esp. c. 2). Fewer have recognized that computer networks allow for unprecedented many-to-many discussions. How might such an architectural change in network connection have an effect on political participation?

Hiltz and Turoff's 1978 *Network Nation* is sometimes accused of uncritically accepting the tie between greater information and better democracy. However, even a cursory reading of the book reveals that it is less about the distribution of information, and more about access to discussion. EMISARI, which was developed by Turoff in the mid 1970s, was among the most significant predecessors of MUDs and MOOs as well as other forms of synchronous and asynchronous computer-based conferencing

systems like Usenet. While access to information does play a part in the book, it is access to other people that is the main topic of interest. The book dates itself only in that it failed to see the coming of the World Wide Web, and the rapid colonization of internetworking by a technology that encouraged the replication of patterns of legacy media. The internet of today is more akin to television than Hiltz or Turoff ever would have expected. Their vision of more dynamic communities of users, while not dead, is far from the ubiquitous goal of those who create and consume content on the web. This has led Andrew Shapiro (1999) to equate most e-democracy projects with "mass democracy" and "push-button politics."

Given these dominant approaches to both news in the traditional media and news on the internet, is there an alternative path? James Curran (1991) suggests that a news industry that serves Habermas's "public sphere" would be a significant improvement. He reviews several models of the press—the libertarian model which is increasingly common in the West and acts as an autonomous check on state power, the Marxist critique of the press which is seen as an agency of class control, and the communist model of the press as an agent of education—and dismisses each in turn. For the press to serve its role in the public sphere, it must accurately represent the social groups of the community, "it should facilitate their participation in the public domain, enable them to contribute to public debate, and have input in the framing of public policy" (p.30). Curran then goes on to specify ways in which the electronic and

print media can be brought closer to this ideal. In part, this can be achieved by counteracting the economies of scale that lead to media concentration. However, there are significant technological limits upon how many voices television, for example, can provide room for. Even if the economic question could be cast aside (and it never can), there are simply not enough television channels to hold a healthy range of ideas. These ideas are more attainable using networked computer communication.

Habermas (1989) argues that the public sphere has been largely diminished by the expansion of commerce into all aspects of life. The functioning public sphere, though it does not require a clunic vow of poverty, does require that directly political and economic concerns are left at the door in order to engage in rational debate. The encroachment of private business into the public sphere has occurred most especially in the case of public relations, not because PR represents economic interests, but because those interests are often intentionally concealed. The place of media in Habermas's public sphere is making public discourse among non-partisans transparent to the larger public. It was never imagined that the mass media was sufficient to allow for a public sphere to emerge and function, though a "transparent" mass media is necessary to allow for the communication of the deliberations within the public sphere to the larger public. Both the sphere of rational discourse, and the media which is needed to report this discourse, have been steadily eroded over the last century.

It is natural to ask what information and communication technologies will bring to the longstanding relationship between mass media and the public sphere. Even if not an ideal solution to the problems of the mediation of public discourse, these new technologies allow us to examine the basis of democratic participation and what elements of social interaction are important in creating a democratic public sphere (Chambat, 1995), and to dissect the unfortunately monolithic view of what information and communication technologies are and can do.

Language of Magic

Computer programmers have long been associated with magic, and those with extensive knowledge about computers are sometimes called "wizards." Perhaps the reason for this is that many find computer programming to be an esoteric art, and think of those capable of it to be in possession of particularly unassailable knowledge[9]. As the "Jargon File" (Raymond, 2001) reveals, the term wizard, as a rarified form of hacker, does indeed imply some form of esoteric knowledge. Beyond this, though, there are a set of terms in the "Jargon File" that refer to magic in one form or another: black arts, black magic, deep magic, heavy wizardry, incantation, and voodoo programming. Raymond also suggests that the hacker culture has ties to the Lord of the Rings books and other medieval (and quasi-medieval) fictional environments. This

[9] There are many programmers who are interested in seeing the privileged status of programming diminished. See *http://www.python.org/doc/essays/everybody.html*, or Papert (1980).

interest in magic is understandable, since the process of programming could easily be considered a kind of magic.

Malinowski (1946) proffers magical speech as the central binding agent among communities. Though in his early work he saw magical speech as diametrically opposed to scientific speech, he later came to recognize that they were not very different after all (1965). Mauss and Hubert (1961) consider magic to be a ritual performed as a private act, one that is "secret" and "mysterious" (p.1088). The content of the ritual is not important, but rather its social role. The authors suggest two defining characteristics of magic. First, magic includes "the idea of power… a force that is not mechanical but magical" (*ibid.*). The realm in which this power is exercised is also ephemeral:

> In this mysterious milieu, events do not take place in the tangible world of our senses. Distance does not preclude contact. Forms and wishes are immediately concretized... However boundless the power may be and however elevated the milieu, events nevertheless follow laws that are the relations necessary to the interaction of thing—the relations of words and signs to the objects signified, laws of sympathetic resonance, and laws of properties susceptible of being codified through classifications… (*ibid.*)

It would be difficult to find a better description of cyberspace and the power of programming. Mauss and Hubert fail to be reflexive in their observation of the magical realm. In describing the world of the "primative" (and especially for Mauss who did little field work, for relying upon others' descriptions of these events) they are performing a magic of their own, linking together their own imaginary space to a

spatially and temporally distant space of objects and actions. Indeed, the Word takes a primary role in many, if not most, religions. Contained within language is the power to build worlds (the title of "world builder" is also seen on the business cards of many game designers) and to breathe life into inanimate objects (see Wertheim, 1999). Many spiritual traditions have mystical traditions that are closely tied to symbolic manipulation, including the Kabbalah and I-Ching, both of which are often topics of interest to programmers, if only in a superficial way. That programmers and others should see mastery of computing languages as somehow mystical is far from surprising.

Programmers use highly formalized descriptive languages to cause the computer to behave in certain ways. Despite the artificiality of programming languages (as opposed, one might suppose, to "natural" language) they are still meaningful to both computers and to human interpreters. Problems can be categorized, systemized, and solved using these languages. Some languages, like Perl, are better for describing a procedure for completing a task, while others, like Prolog, are better at describing the relationship between various symbols. In either case, the process of creating a computer program is one of producing language that acts as a machine or a device.

The issue of whether computer languages are more like speech or more like devices is one with very real policy implications. With the passage of the Digital

Millennium Copyright Act, creating a device that circumvented any copy protection technology was made illegal in the United States. The first case tried under this provision was brought on the behalf of several motion picture studios against those who were distributing a program called DeCSS (see Halavais, forthcoming). DeCSS allowed users to copy the contents of Digital Versatile Disks (DVDs), and at least in theory to distribute very accurate copies of films over the internet. One of the defenses offered was that the source code was a form of speech, and as such the defendants were protected by the First Amendment. This followed the reasoning of earlier court decisions that found that the source code of certain encryption algorithms were considered speech, and could be published and exchanged freely. In the initial judgment in the case (it is currently under appeal), Judge Lewis Kaplan found that First Amendment protections did not apply. He recognized that computer source code could be expressive, but it was not "purely" expressive, "any more than the assassination of a political figure is purely a political statement" (*Universal v. Reimerdes*, 2000).

That something created as an expression of a process, something that could easily be created with pen and paper, constitutes a device or a mechanism is remarkable. A professor at Carnegie Mellon University demonstrated the absurdity of the idea by publishing on the web a gallery of artistic versions of the DeCSS code,

including a dramatic reading, a haiku, and several pieces of visual art[10]. On the other hand, suggesting that these programs are "only" speech is equally preposterous. When typed, or otherwise loaded, into the proper kind of computer with the right kind of software, DeCSS allows the computer to perform an illegal act—or perhaps more exactly, allows an individual to commit an illegal act using the computer (although the DMCA makes the distinction unclear). Computer code is a particular kind of speech: speech that has the ability to cause change in an informational and, by extension, a social system.

Complicating matters further, the code used to program computers can define the ways in which computers communicate with one another, as well as constrain the ways in which people use the computer to communicate. The Web itself exists as a result of a set of code, designed with a social system in mind. According to Tim Berners-Lee, who continually reasserts the importance of social organization to the World Wide Web: "The Web is more a social creation than a technical one. I designed it for a social effect—to help people work together—and not as a technical toy. The ultimate goal of the Web is to support and improve our weblike existence in the world" (1999, p.123). The same is true of the Slashdot web log described in the first chapter. In both cases, how people communicate with one another is determined in part by the formal language of source code. Naturally, these constraints are not

[10] See *http:// www.cs.cmu.edu/ ~dst/ DeCSS/ Gallery/ index.html*

unidirectional (users often use technologies in ways unintended by their creator), but they are certainly influential. Beyond this level of social control through computer code, there is a further level of control at the level just beyond formal computer programming languages.

The internet itself is driven by code that is constrained by a set of protocols (TCP/IP). These protocols are not written in source code, but in English (albeit a particularly jargon-filled technical English). The basis of the internet is a set of Requests For Comments (RFCs) that define in a very specific way how programs on the internet should behave[11]. The result is not source code (that is, it cannot be directly interpreted and executed by a computer), but it is formal, and can be readily incorporated into an application. The process of creating RFCs, these documents meant to constrain the behavior of computers, also extends to describing and constraining the behavior of computer users, both indirectly and directly. Indirectly, programs written in compliance with these RFCs restrict, in turn, the capabilities of its users. More directly, many of the RFCs are intended to provide guidelines not for creating computer programs, but for the behavior of individuals using the computers. For example, some act as documentation on the overall concepts surrounding the internet: "What Is the Internet?" (RFC 1462) and "Answers to Commonly asked 'New Internet User' Questions" (RFC 1325). Others are documents that act as "a summary

[11] RFCs are archived at many web sites, including *http://www.cis.ohio-state.edu/Services/rfc/*.

of the 'oral tradition' of the Internet" (RFC 1173: Responsibilities of Host and Network Managers). When first introduced to the internet in the early 1990s, most new users learned about it through "The Hitchhikers Guide to the Internet" (RFC 1118). A total of 15 RFCs make mention of "netiquette," a set norms of behavior for those who make use of the internet. A number of the RFCs are dedicated to humor and satire, including "ARPAWOCKY" (RFC 0527), "The Roman Standards Process – Revision III" (RFC 2551), and "Standard for the Transmission of IP Datagrams on Avian Carriers" (RFC 1149). Requests for comments demonstrate just how fuzzy the line between programming and poetry can be. Much of the language in RFCs are designed to provide a source of control, but of social systems and of individuals.

This ambiguity between written codes of behavior and computer code is one that has been recognized for a long time among programmers and is beginning to be more widely acknowledged by policy-makers. Stewart Brand (1987) dedicates his book on the MIT Media Lab to "the drafters and defenders of the First Amendment to the U.S. Constitution: *Congress shall make no law . . . abridging the freedom of speech or of the press*. Elegant code by witty programmers." He was certainly not the first to recognize the constitution as technology of politics; Daniel Boorstin (1978, c. 4), and surely others, have noted that the design of a functioning set of legal structures holds much in common with the design of a machine. Lawrence Lessig (1999) develops this theme further in his book, *Code*. He begins with a phrase from John

Perry Barlow's (1996) "A Cyberspace Independence Declaration"[12]. In this short polemic, Barlow borrows the motto from the IETF (coined by Dave Clark in 1992; see Dyson, 1998) and claims that those on the internet "believe in… rough consensus and running code." For Lessig, "code is law" (p. 6) in that it regulates activity in cyberspace[13]. We might look at this in reverse: law is more than "only" language. It interacts with the institutions of the state to particular ends. When interpreted by the state apparatus, it acts to constrain the actions of the subjects of the state. While it may never be immutable, the expression of social norms in the form of law provides them with a social force (that of the state) that might otherwise be absent.

Lessig explicitly argues that open source code leads to less governmental control, but more participatory legal structures. Since code is a form of regulation just as law is a form of regulation, and since it is the predominant form of regulation in cyberspace, it is important to understand how that code comes into being. This introduces one of the problematic elements of magic—that it is a secret ritual. Arthur C. Clarke's familiar maxim, that "any sufficiently advanced technology is indistinguishable from magic," begins to break down in an open source world. Once the making of code is made a public process, the mysticism is removed. Lessig argues

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[12] Incidentally, Barlow's "Declaration" was written in protest of the Communications Decency Act (CDA) being signed into law as part of the Telecommunications Act of 1996. The Supreme Court's decision to declare the CDA unconstitutional drew explicitly from an analysis done by Lessig.

[13] Various permutations of this abound. An EFF white paper, for example, titled "Architecture is Policy" argues that privacy protocols end up being the concrete execution of privacy policy (Lemmey, 1999).

that there may be good reasons, at times, to produce closed code, but that especially for code that has widespread regulatory effects, open source provides a much greater opportunity for transparency and democratic control.

Let us return, for a moment, to the kinds of speech that take place in cyberspace. In the following chapter, this is discussed in more detail. For now, it is important to recognize that there exists a particular form of speech in cyberspace that is an act. As Julian Dibbell explains, the online world breaks down the "firewall between word and deed," that "the commands you type into a computer are a kind of speech that doesn't so much communicate as *make things happen*, directly and ineluctably, the same way pulling a trigger does" (quoted in Slouka, 1995, p. 52). These sorts of speech acts happen in everyday speech, if in diluted form. As noted above, the proscriptive language of law represents one such example, though the action may not be immediate. There is a distinct difference here. Dibbell's claim that words in cyberspace "make things happen" is not entirely accurate. Words in cyberspace make *people* believe things happen. Laws make people behave in certain ways, as well. Though there may be a mysterious power involved, it is over people, not things.

Kenneth Burke makes this difference very clear: the real use of language to induce change in people "became the magical use of addressed language to induce motion in things" (1950, p.42). That is, perlocutions, in the "savage mind" are thought

to extend to the world of facts and objects. Habermas's theory of communicative action (1984) attempts to unite his earlier theory of the public sphere with some idea of how such a sphere emerges through discursive practice. One of the prerequisites for the emergence of a public sphere is a move away from mythical thought to more rational forms of social world-building. Habermas argues (p.48) that the only way to move from a mythological to a rational conception of the world is to clearly differentiate between a natural world of objects and a constructed social world.

Of course, computer networking makes this very difficult[14]. If we see virtual reality (VR) as the ultimate goal of at least a significant stream of computer development, computers tend to blur the distinction. In order to believe that one is immersed in a VR world, one must actively forget the mechanisms that make such a feeling possible. By making the code visible, by pulling the curtain away, the user at least has the option of rationally considering and discussing the structure as it is designed. As Alan Kay notes:

> It's almost impossible for most people to see technology as the tool rather than the end… People get trapped in thinking that anything in the environment is to be taken as a given. It's part of the way our nervous system works. But it's dangerous to take it as a given because then it controls you, rather than the other way around. That's McLuhan's insight, one of the bigger ones in the twentieth century. Zen in the twentieth century is about taking things that have been rendered invisible by this process and trying to make them visible again. (quoted in Hiltzik, 1999).

[14] "Computer Science then is a discourse at the border of words and things, a dangerous discipline because it is founded on the confusion between the scientist and his or her object" (Poster, 1990, p.148).

That software might be demystified using extensive computer networks might at first blush seem contradictory, but one finds an interesting analogy to some fictional work: both Italo Calvino's *If On A Winters Night a Traveler…* (1981) and Jorge Borges's story "The Garden of Forked Paths," (1962) each act as an intentional demystification of the process of creating fictional worlds, each within a fictional work. Rationalizing software does not mean eliminating it. Rather, it means that those who are users are not being used, that they have the ability to collectively alter the existing socially agreed-upon structure.

By making computer code alterable, a consensus can form that does not rely upon the structural contrivances of the author. The assumption that existing software is the natural way, the only way, to use a computer to solve a problem is widespread and endangers social and technological innovation[15]. As software is "de-natured," the social world may increasingly be defined through agreement among user-builders, rather than by programmers, or, in Habermas's words, we must do away with the "'closedness' of mythical worldviews from two points of view: the insufficient differentiation among fundamental attitudes to the objective, social, and subjective

[15] One of the ways it does this is by encoding cultural presumptions into the software. Since software is often assumed to be neutral, these presumptions carry the force of truth. The urban dynamics of the game SimCity, for example, may be entirely contrived, but may be considered by the user to be applicable to the dynamics of real cities (Friedman, 1999), or the social and cultural values of the United States may be encoded in the processes that a user is required to follow, diminishing local differences in thought, belief, and action (see, for example Afemann, 2000).

worlds; and the lack of reflexivity in worldviews that cannot be identified *as* worldviews, as cultural traditions" (p.52).

There has been, over the last few decades, a great deal of theoretical work done on the ways in which social systems and technological systems fit together. Some argue that technological systems are socially determined, while others suggest that the social and the physical are separate regions with limited interconnection, from the perspective of engineering. John Law (1989) suggests a new term, the "heterogeneous engineer" for the designer who works with systems that are made up of social and material elements. For the heterogeneous engineer, "the social, the economic, the political, the technical, the natural, and the scientific" all must work together within the same system for the technology to be successful (p.130). He provides several examples of this, but it would be easy to think of recent technologies that failed on economic or social levels even if functional strictly from the mechanical or technical standpoint: the betamax video system and Microsoft's "Bob" operating system, for example. Indeed, the success of Gutenberg's printing press might have had far more to do with these "external" systems than with the machinery itself (He, 1994). An approach that minimizes the emphasis on the mechanisms and looks at the emergence of technical systems from the perspective of the system leads to different design values. Rather than looking for the fastest, or most efficient possible way of completing a task, the engineer looks at how the addition of a new element will

affect other elements in the system, the degree to which the technology will be flexible enough to fit into a variety of contexts, how this technology affects others that may be in use, and most importantly, the impact of social structures on the usage of the technology and the impact of the technology on social structure (Nardi & O'Day, 2000).

Computer programmers represent a peculiar sort of heterogeneous engineer, since they use language both to design machines and to design organizations. Symbolic action is capable of each to an important degree, and the ideals of one leak to the other. That the technical and the social grow together has been a point of criticism of both the industrial and the information age. They have drawn such criticism because many wrongly predicated their arguments on an imaginary pre-technological (i.e., "natural") era. Technology and social action have always been intimately tied. The assumption is that since the appearance of mass society that came about with mass industrialization was so traumatic, the information age will further dehumanize social interaction. It may well do so, but there is nothing inherent in technology that makes it dehumanizing. It is true that technologies are rarely neutral, but at this stage computer networking remains very flexible. The future of social organization and networking technology is in the process of being made. In some ways it is bound to be made in the patterns of social and economic systems it has

inherited. If the last three decades are any indication, it will also produce significant challenges to these systems.

Stefic (1999) devotes a chapter of his book, *The Internet Edge*, to the magic of computing technology. He writes of how the process of creating an enchanted world has driven many of the advances of the internet, particularly in its connection to the physical world through pervasive, ubiquitous, and wearable computing. He warns that there are also many precautionary tales of the use of magic, from Tolkien's magic ring to the ruby slippers. Technologies, to use Edward Tenner's (1997) phrase tend to "bite back." Demystifying the magical social technologies of the computer requires that more people understand how they work, and how cyberspace is shaped. This does not mean that citizens should all become computer experts, any more than they should become nuclear physicists, Spanish historians, or automotive engineers. They should, however, understand how decisions about how technology is used are also decisions about how people are used, and that a democratic society must have mechanisms by which people can help steer their own course as a society. The mystery of the machine must be smashed. There is a process of "bootstrapping" that must be brought about for such a shift in power. Computer programmers have been thrust into the role of social engineers, perhaps unwittingly. In order to successfully navigate the complexities of the social-technological dynamic, they must retain elements of a radically open ethic, while remaining close to the hegemonic structures they will help change.

Counter-Hegemony

It would be wrong to assume that all computer professionals are hackers, or that hackers are, by nature, good for the democratic process. Many rightly fear that the rise of networking technology will spur the expansion of technocratic rule-making institutions. While Barlow's "rough consensus and running code" might work for the Internet of the 1980s and 1990s, it is far more difficult to achieve when the pressures become global and when governments and private interests are insisting on increased control of the medium. The Internet Corporation for Assigned Names and Numbers (ICANN) was initially established to help remove the monopoly granted to Network Solutions in assigning domain names. What had originally been a free service for naming internet hosts had, with the introduction of commerce to the internet, become a profitable and contentious process. It was thought that ICANN could become more representative of the internet community, and included board members from constituent companies and engineering groups, as well as members (a minority number) elected by internet users as a whole. This body, which had its roots in the less politicized management of the early internet, now exercises a substantial degree of control over issues of intellectual property on the web, and has established its own system of mediation that pre-empts courts at the national level. For some this describes a trend. Along with agreements like the Cybercrime Convention (Council of Europe, 2001), which would allow police forces to gather evidence across borders

among the signatory nations (including the U.S. and Japan), some are concerned that the rule-making in cyberspace could come to exert significant supra-national control.

In 1912, Rudyard Kipling wrote a short story called "As Easy as A.B.C." (a sequel to an earlier story titled "With the Night Mail") in which he gives an account of the world in the year 2000. The airplane has been overtaken by the dirigible and an "Aerial Board of Control" is established to provide global control of air traffic and "all that implies." The reliance on global transportation—especially for communication, which is handled through the mails—has led to the decline and eventual disappearance of local control, and the A.B.C. has become a global fascist regime:

> The A.B.C., that semi-elected, semi-nominated body of a few score persons, controls the Planet. Transportation is Civilisation, our motto runs. Theoretically we do what we please, so long as we do not interfere with the traffic and all it implies. Practically, the A.B.C. confirms or annuls all international arrangements, and, to judge from its last report, finds our tolerant, humorous, lazy little Planet only too ready to shift the whole burden of public administration on its shoulders. (Kipling, 1925)

Especially given the status of the Government Advisory Council as ICANN advisors, the question of ICANN taking up a growing role in world government is one that is raised often, along with the democratic control of the ICANN (or lack thereof). When asked whether ICANN was "some sort of world government," Vince Cerf, then-chairman[16], replied "Aaaargh" and explained that this was an artifact of people's recognition that ICANN

[16] As well as representative of several industry groups and one of the early contributors to the creation of the internet.

exercised a significant amount of power and that this power had the *potential* to be abused. This was not, however, a "fruitful" way of thinking about the problem, according to Cerf (Krempl, 2000). In testimony before the U.S. House Committee on Telecommunications, Jerry Berman and Alan Davidson, directors of the Center for Democracy and Technology, argued basically the same thing—that it was intended mainly as an organ for deciding technical standards but had the potential to become more than that. This potential was worrying since ICANN did not appear to adequately represent the users of the internet[17].

This would seem to be evidence for the link that is often made between computer networking, bureaucracy, and centralized control. Unlike the circumstances that Johnson and Post (1996) describe, in which on-line groups create their own "emergent" common law, ICANN seems to fall into the kind of globalized technocracy that many fear is the natural potential of technologies of control like the internet. Technologies of communication and control, they argue, tend to form into increasingly standardized and rationalized systems. Ellul (1964, p.95) borrows the example of the printing press from Lewis Mumford. While the printing press itself might have disrupted hegemonic communication patterns, it did not take long before the

[17] See *http://www.cdt.org/testimony/010208davidson.shtml*

organizational practices that surrounded the technology allowed it to become the newspaper, the prototypical mass medium that expanded and reinforced the dominant structures of power. The printing press changed little in the first centuries of its existence, it was those who used the machines who had changed; "journalistic content is a technical complex expressly intended to adapt the man to the machine" (p.96). Ellul allows very little opportunity for the individual or group to use technology in a way that escapes the mentality of the mechanical.

Critics of computer networking often see it from the perspective of the mechanism: the predictable and exacting meshing of gears—cogs both mechanical and human. The view of what it is to be mechanical has begun to change slowly. Rather than clockworks, more organic views of the nature of machines are beginning to become common. The Laplacean demon set aside, we have recently come to recognize the degree to which similarity can occur across scales, even as local systems are indeterminate. That is, it is increasingly possible to detect systemic organization, and at the same time, individual parts of the system may behave in completely idiosyncratic ways. Barber (1995) coins the term "glocalization" to describe this seeming contrary cultural tendency toward both globalization and tribalization. We might just as well refer to it as "complexification"—that is, a simultaneous display of emergent

order on the large scale and diverse autonomous action at the small scale—only beginning to be recognized in the social sciences (Bar-Yam, 1997, c. 9) and particularly global communication (Mainzer, 1994, pp.282-305; Kauffman, 1995, pp.273-304).

This dual nature of computers, leading to global authority and local autonomy, produces examples of computers being used to counter hegemonic structures. The most well-known example of this is the use of the internet by the Zapatista National Liberation Army. The Zapatistas have established a widely recognized political position in support of autonomy in southern Mexico[18]. They are often seen as the most successful virtual organization that has been established to challenge authority. While they have used a combination of media to do this, they have made the most extensive use of the internet, both to get their message out to a larger audience and to mobilize action: demonstrations in Mexico City, fund raising in the United States, and conventions for other groups who oppose free-market reforms. Most importantly, the media discourse on the Zapatistas was forced open. Because the internet allowed for the opinions of the rebels, the Church, journalists, NGOs, the Mexican government, and other commentators to all be heard, the traditional closed media were forced to carry a wide range of opinions to be able to compete (Moreno Toscano, quoted in Castells, 1997).

[18] A great deal has been written about the Zapatista movement, but the best source of information is the primary discussion that exists in many forms on the web itself. Cleaver (1999) provides a number of good links to this information.

Castells's (1997) assertion that the Zapatistas represent the "first informational guerrilla movement" (p.79) may be overstated. Information and propaganda have always been central to the creation of resistant groups, and the early stages of uprisings and revolutions. American separatism emerged first in the press, especially through Paine's *Common Sense*. The Boston Tea Party and other demonstrations were communicative, intended to "send a message." Even by the beginning of hostilities, enlisting a revolutionary army was often more a rhetorical task than anything else (Zinn, 1980, pp. 77-80). In the case of the French Revolution, again rather than a spontaneous convulsion, bloody action was preceded by an informational onslaught: antagonisms expressed in oration and public letters between Pierre Jurieu and Jacques Bossuet, Gabriel Maultrot's three volume treatise on the power of the people over kings, as well as writings by Fénelon, Montesquieu, and d'Argenson and Turgot (Acton, 1959). J. Edgar Hoover (1958) saw the "red menace" as almost entirely informational, with the distribution of the "Party Line" as the strongest weapon of communism in the United States. Perhaps because our own field owes so much to the study of propaganda, it is difficult to accept that informational warfare is that new. Modern guerilla warfare and terrorism is focused directly at winning communicative battles, as these are often the most effective path to control over resources and land, especially when there is the need to reach a geographically distant target (Luttwak, 1987, p.225).

Given that information has always been a central part of guerrilla warfare (i.e., defensive insurgencies), what is it that Castells and others see as being particularly new about the process? John Arquilla and David Ronfeldt of RAND are among the most visible proponents of the idea of information warfare, an idea that is receiving increasing attention from the U.S. government, which sees it as a significant threat that cannot be battled using conventional armed forces. With Castells, Arquilla and Ronfeldt see the Zapatista movement as a prototypical informational guerilla movement. They argue (Ronfeldt et al, 1998) that two factors of the information revolution have allowed such movements to emerge. First, that non-hierarchical "all channel" networks, in which many people are able to use a medium to connect to many others, are able to challenge hierarchies in a way that they have never been able to before. In order to neutralize such challenges, the authors argue, hierarchical governments are going to have to learn how control over such networks is achieved. Second, more than ever before, conflicts are intended to control knowledge and the flow of knowledge: "about who knows (or can be kept from knowing) what, when, where and why" (p.7).

These two factors that define what is important about "netwar" seem to have broad applicability to other forms of resistance and political autonomy. As Ronfeldt et al suggest (p.10), it is very likely that many forms of non-state actors will make use of similar network organizations: everyone from NGOs participating in the creation of a

new global civil society to terrorists who make use of the networks to provide a safe haven from which they can conduct their campaigns. While the Zapatistas represented the clearest widely-recognized example of these groups, others have quickly followed: Falun Gong adherents, militant neo-nazis (and their opposition), a group opposing Nicaraguan sweatshops, B92 (the Serbian dissident radio station), the Malasian "reformasi" movement, all able to avoid government censorship and amass a global network of support (Engardio, 1999). While many have noted the flattening of hierarchies in other areas—management of corporations, for example (Drucker, 1988, p.25)—it remains voluntary organizations that have made the most of the networked communications environment.

Stewart Brand's (1972) *Rolling Stone* article on the "intergalactic Spacewar championship" is more than a story about an emerging technology, it speaks to the genesis of networked voluntary organizations like the Zapatistas, and how these might affect a larger segment of the population. It is worth noting at this point that while the Zapatista movement presents an interesting "bracket" of anti-authoritarian activity, calling them both "movements"—despite the frequency of the term[19]—might seem an overstatement. The open source movement contains none of the expressly political elements that Bottomore (1979, pp 28-34) uses to define the term, for instance.

[19] To provide some indication of how prevalent the use of the word "movement" is, consider the following: according to a Lexis-Nexis search on major newspapers during the 2000 calendar year, there were 661 articles that made some mention of "open source," 52 of which used the phrase "open source movement." Google retrieves 23,500 pages that use the phrase "open source movement."

However, the story does provide some indication of how the computer community can act to change cultural values, and the politics undergirding them. Iacono and Kling summarize the literature on social movements as focusing "on the rise of organized, insurgent action to displace or overcome the status quo and establish a new way of life… Large-scale computerization projects are typically accompanied by political struggle and turmoil as the established structure is threatened and powerful actors fear being displaced" (1991, p.90). Certainly open source represents such a threat, and while participants in the open source movement usually dismiss claims that the movement has a political element, there can be little doubt that its impact on issues of intellectual property is, regardless of intent, political[20].

The *Rolling Stone* story is a contemporaneous account of the *sui generis* hacker culture, more than a decade before Steven Levy's authoritative history (1984). It details the actions of a group of programmers—many students, some not—who were using computers to do things that people did not usually associate with the machines. They were using technologies that had been developed with funding from the defense department to do accounting for their commune, or, just as likely, to play games. The idea that computers could be played with, and could engender playfulness, seemed revolutionary. Up until this time, computers had "been a priceless aid in keeping the lid on top-down organization," but as computers became inexpensive

[20] Eric Raymond has dismissed the term "social movement," saying that it sounds too coercive and makes him want to "reach for his gun" (quoted in Chapman, 1998).

enough that communities, or even individuals, could control them, they offered an opportunity to balance the use of computers by "authority." The use of computers to provide for less hierarchical alternatives would provide a check against misused computer power, as would "any funky playing with computers or any computer-pursuit of your own peculiar goals." Brand concludes:

> In those days of batch processing and passive consumerism (data was something you sent to the manufacturer, like color film), Spacewar was heresy, uninvited and unwelcome. The hackers made Spacewar, not the planners. When computers become available to everybody, the hackers take over. We are all Computer Bums, all more empowered as individuals and as co-operators. That might enhance things ... like the richness and rigor of spontaneous creation and of human interaction ... of sentient interaction.

Brand's hyperbole aside, the spirit of the hacker ethic infected many of those who were otherwise very critical of the increasingly ubiquitous surveillance and control of the state, and those who were critical of computer use. Theodore Roszak (1986), hardly known for being a starry-eyed technophile, finds much to like in the counter-cultural adoption of the microcomputer. The view of the microcomputer as a resistant device, a tool for conviviality, and a people's technology seems to hold promise. However, Roszak marks the end of counter-computing as 1984. Indeed, the crash of the microcomputer and video game market left most commentators in doubt of a future for personal computers, and once the market recovered, it looked very little like the Homebrew Computer Club of the 70s, and more like Big Blue. Bill Gates and Paul Allen appear as talented young programmers in Levy's book, and their audacity at

asking to be paid for their BASIC interpreter for the Altair computer casts them as greedy and unethical, at least in terms of the prevailing hacker ethic. Little did anyone know that they represented the what would be the dominant paradigm through the 1980s and 1990s.

The actively competitive programmer is antithetical to the hacker ethic. While many are boastful and self-admittedly egocentric, they also recognize the importance of "mutual aid." This term is, of course, most often associated with Peter Kropotkin's work in biological evolution and by extension (or in conjunction) his writings and political activity related to human organization. Rejecting the dominant idea of a savage world of the "survival of the fittest," popular among English Darwinists, he argued that intra-species conflict was rare, and that the fittest animals were those that cooperated with their peers. From this observation, he formed his theory of "mutual aid" within human societies, and developed a particular anarchism that built upon the work of Bakunin (Kropotkin, 1988). It would be wrong to assume that the ideas of anarchism, communism, or collectivism pervade the open source community—clearly there is a significant libertarian strain (that is, pragmatic freedom from government control, though not necessarily from ownership) that finds its expression so often in *Wired Magazine*. The ideas behind Kropotkin's revolutionary ideology, however, make up an important part of the hacker ethic. Raymond (1999), despite being a self-

styled libertarian, makes fleeting reference to Kropotkin's ideas, and Richard Stallman has been called the "Prince Kropotkin of Software" (Bezroukov, 1996).

Contrary to many critical scholars who would come later, Kropotkin thought that the rise of technology would allow for the further withering of the state (Kropotkin, 1901). This alone, was not enough. Especially the younger Kropotkin urged action, and hoped that the anarchist would take every opportunity "to propagate and find expression for dissatisfaction, to excite hatred against exploiters, to ridicule the government and expose its weakness, and above all and always, by actual example, to awaken courage and fan the spirit of revolt" (1880). The creation and distribution of open source software is just such an action, and an attempt at small-scale revolt[21]. The natural question is whether this will extend beyond the world of software into other areas of corporate and government control. Because software is playing such a central role in the information economy, there are already indications that it will affect areas as diverse as military technology, music distribution, and education. More importantly, Kropotkin saw action among a few "madmen" as the vanguard necessary to polarize an already dissatisfied mass public. As an article in the *China Youth Daily* recently opined: "The rise of Linux is legendary, a little like the peasant uprising of Chen Sheng and Wu Guang. In a world of hegemony long

[21] Raymond is also a vocal advocate of gun owners' rights. Many interviewers mention this fact, and that he often goes shooting with other open source advocates. A report by Forrester Research that indicates that open source techniques will be the industry standard by 2004 ends with a tongue-in-cheek warning to "beware of geeks bearing guns" (Delio, 2000).

suppressed, many feel oppressed but the majority doesn't know where their suffering originates. Once someone stands up, he will have followers like clouds" ("Anti-Microsoft," 1999).

In searching for the place of computer professionals in the political world, we can make a few observations. First, just as technicians throughout the industrial era, computer professionals often aid in the maintenance of the current *status quo*. They do so by making efficient tools, and providing these tools to those who employ them. Because these employers are most often large corporations and governments, the work of computer professionals often is in the service of existing hierarchies[22]. On the other hand, many computer professionals adhere to the hacker ethic, an ethic that is at odds with the prevailing ideologies of global capitalism, or (as in the case of intellectual property), directly and actively opposed to them. What makes the situation more interesting is that while there are certainly those who work in one camp or the other, many computer professionals are, in the words of both Raymond and Torvalds, "accidental revolutionaries," working at the same time within hegemonic structures and against them[23].

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[22] Consider the following recruitment page from the National Security Agency: "Keep your feet and hands inside the ride at all times. It's been said that the systems environment we offer is a veritable fantasyland for computer science, with vast networks that manipulate huge volumes of data and accomplish information analysis at mind-boggling speeds" (*http://www.nsa.gov/programs/employ/index.html*). The NSA hires more mathematicians than anyone in the world (Drogin, 1999), as well as more computer scientists and linguists than any other US employer.

[23] Raymond insists that remaining focused on the spread of open source software means remaining silent on wider political issues. He offers a thinly veiled critique of Richard Stallman, and warns against

Technologists as Intellectuals

An institutionalized counter-cultural force requires two elements. First, a group of people is needed who are capable of acting professionally and collaboratively to work through technology and policy problems and to attempt to educate the wider public and influence how policy is made. Second, a place or structure must exist that provides a framework in which members of the community can interact, and that allows for transparent and open dialogue.

For Ellul, the worst person to be making technological decisions is the technologist. He notes that in democracies, technologists often overtake politicians and politics is increasingly a technique. Winner sees things differently. We've already encountered his criticism of computer-related "mythinformation," but he has concluded that for better or for worse the future of human relations is hopelessly "intertwined" with computer networking. "By virtue of their vocation," Winner (1995, p.71) writes, "computer professionals are well-situated to initiate public debates on this matter, helping a democratic populace explore new identities and the horizons of a good society." He notes that computer professionals must accept more participatory

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ideological posturing. At the same time, he recognizes that, by its nature, free software works against entrenched interests (1995, pp.225-7). Geert Lovelink (1997), a frequent contributor to on-line theoretical discussions, wonders whether the political element is vital, and has written that "the virtual intellectual should be located in the sphere of the negative. Even in the pragmatic work of programming, designing interfaces or the planning of network architecture, the negative should be our starting point. The main threat to a critical praxis nowadays comes from the positive, 'humanistic' intentions, or what Calin Dan the 'dictatorship of good will'" (sic).

design approaches, and recognize what it is that "consumers" want. He writes that "what people seem to be excited about," despite heavy promotion of interactive television, HDTV, and movies-on-demand by the industry, "are networks that have open architecture, networks of many-to-many communication in which people can be more than passive consumers of information, but also producers, creative actors able to tinker with new possibilities and perhaps give them a distinctive personal stamp" (p.70).

More than three decades ago, James Carey (1969) wrote an exploratory essay detailing the place of the "professional communicator" in the communications revolution. Carey claims that the technologies that allowed for relatively inexpensive newspaper production—the "penny press"—led to a revolution in how groups communicated. He suggests that two contradictory forces were put into effect. The creation of a mass medium that could spread across the geographic and cultural boundaries of the United States brought together a nation that had until then had very little in the way of communicative ties. At the same time, it allowed geographically disperse communities of interest to form in a way that had never happened before. He gives the example of two publications intended for homosexuals, and suggests that these publications helped to create a shared culture among a group that would otherwise not have been able to form a cohesive set of communicative ties. This duality is very much in force on the internet, in perhaps a more extreme degree than

newspapers could ever provide. Because of the very minimal costs required to set up systems of communication based on the internet, and because of the inexpensive global reach of the medium[24], communities can form that would have been very unlikely if not for the emergence of the internet. On the other hand, the on-line environment is dominated by sites designed by large corporations that are intended for a mass audience that extends well beyond the borders of the U.S., though most of these remain centered upon American culture, and especially, one might argue, upon the particular values and cultural background of the San Francisco Bay area[25]. The result is complexification at both the micro and macro levels. However, it appears as though the building of mass culture that came with the industrial age is beginning to crumble in interesting ways. With it, the practice of journalism must now adapt to communication technology that allows for (though does not necessitate) a new "chaotic democracy" (McNair, 1998, p.164).

Carey feels that these two tendencies have created a "new social role," that of the professional communicator: "one who controls a specific skill in the manipulation of symbols and utilizes this skill to forge a link between distinct persons or

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[24] It should be noted that the global reach of these community-based media, while cheaper and more interactive with the internet, are not at all new. As early as 1922, Robert Park noted the global reach of ethnic newspapers, and more recent investigators (Subervi-Velez, 1986; Laguerre, 1998) have found similar links between ethnic media—newspaper, radio, and television—and communities across the globe.

[25] One could argue that the World Wide Web has led to a faster and more complete concentration of ownership than previous media. Where a total of 11 companies accounted for more than 50% of the traffic on the Web a year ago, only four companies (AOL, Microsoft, Yahoo, and Napster) receive more than 50% of the hits in mid-2001 (Kampner, 2001).

differentiated groups… a broker in symbols, one who translates the attitudes, knowledge, and concerns of one speech community into alternative but suasive and understandable terms for another community" (p.27, as are the following quotations). Those acting as professional communicators link groups "vertically and horizontally"; that is, they link élites with "general audiences" as well as linking groups that are at the same "level of social structure." The professional communicator may work in mass media in journalism, art, advertising, public relations, technical writing, and the like, or may work in the "face-to-face" environment, as a translator or a salesperson, for example. Carey argues that we should recognize the common ground these occupations share.

The effect of the industrial revolution on the profession of journalism was to make it into a technical art—"a conversion that can be fairly termed 'a conversion downwards'"(p.32)—in which the work of the journalist was seen as presenting an "objective" recollection of the facts. It was moved from the intellectual world of writing to a purely technical practice. Carey laments the loss of intellectual engagement and sees the role of a technical journalist as obscuring events and passing an unreasonable amount of power to sources in an effort to be "objective." This move toward the technical results in the dominance of massification in the media, and to a subsequent imbalance.

Antonio Gramsci considers the "intellectual" an important part of his political philosophy. For Gramsci (1957), the intellectual is not so much defined by her actions as by her role in society. Everyone engages in thought, to some degree or another, but this does not make them an intellectual any more than (to use his example, p.121) frying an egg makes someone a chef. The social context in which this thought occurs is what is important. It is for this reason that journalists are the epitome of the intellectual at least when they are "actively involved in practical life, as a builder, an organizer, 'permanently persuasive.'" They are intellectuals in Gramsci's view in large part because he moves beyond the purely technical aspect of the journalist and adds the "humanist historical perception, without which he remains a 'specialist' and does not become a 'leader' (specialist plus politician)"[26]. This incidentally corresponds well with Merton's view of intellectuals as those who "devote themselves to cultivating and formulating knowledge," and do not act merely as "a cog in the transmission belt of communicating ideas forged by others" (quoted in Stehr, 1994, p.177). Though certainly not opposed to technical education (2000, pp 62-4), Gramsci thinks the role of the "integrative journalist" is not a passive reporter of events, but someone who translates between "grammars" and unites groups. They can do this in the service of the hegemony (and most do), but they can also become subaltern intellectuals, gathering together counter-hegemonic groups. Schumpeter moves this

[26] p.122. Gramsci's view of the role of the journalist was likely tempered by his own tenure in the profession.

argument into the twentieth century and suggests that while mass society might be increasingly alienated by both differentials of incomes and power brought about by capitalism, it will take the work of the (also increasingly disenfranchised) growing group of intellectuals to shape a movement that takes advantage of this dissatisfaction (1975, pp.145-55).

Most computer programmers already fit into the social role of the professional communicator that Carey describes. That is, they are rarely choosy about what sort of programming they do, and often take on work with a professional distance. At the extreme, they embrace the ideal of the "samurai" (Raymond, 2001) and ignore legal or moral questions, aside from a strict loyalty to the employer. There is the potential, however, for computer professionals to become the "organic intellectual" that Gramsci describes. This is not a function that is normally ascribed to programmers. They are seen primarily as engineers, working with things and not with people. Indeed, if anything, they are seen as anti-social, encouraging divisiveness and insisting that discourse be lowered to the level of machines. On the other hand, there does seem to be some affinity between the definitions offered by Carey and Gramsci, and the work of computer programmers and analysts, particularly those who design systems that help make the computer a communications device.

Take, for example, the design of the Slashdot website. The actual process of converting an idea to working code is, while heavily dependent on symbolic

manipulation, not a particularly communicative task. The lone programmer converting a specified algorithm into working code is, however, the exception rather than the rule. Moreover, many programmers find such tasks to be trivial and uninteresting work[27]. The creation of a complete system requires that you consider a potential user (similar to Umberto Eco's "model reader") and how she hopes to make use of the software. Creating the software for the Slashdot website required that the authors think not only about the technical requirements of the site—how to make sure that information was stored and not lost, and that the system made use of resources in an efficient way, for example—but the social requirements: who would want to post and why, how to make the vast number of posts easily parsed and understood by the average user, and the wide range of potential "types" of user. The process of creating such a site is much more akin to that of urban designer than it is to the construction worker who builds to these designs. The difference is that in the case of programming, the programmer takes on both tasks.

The negative aspects of professionalization have started to affect programmers in much the same way they affected journalists of the last century. The rationalization of the process of programming, which includes an increase in the use of exam-based

[27] At least when the specifications of the system are defined by others (e.g., managers). The creation of device drivers—small programs that allow the operating system to communicate with various hardware—is seen as something of an initiation process for many in the open source community.

certifications[28], has led programming to increasingly be seen as a technical specialization, devoid of a social or moral dimension. As Carey notes, the driving force in creating such a move in journalism was the increased encroachment of economic and business concerns. This is true in the software industry as well. While the Microsoft anti-trust case has attracted a significant amount of attention, fewer have recognized that Microsoft represents only the strongest in a sector that is increasingly one of conglomerates rather than hackers working in garages. Even for programmers that work for large corporations, open source provides a chance to engage in a form of design that exists outside of the structures of authority they are accustomed to.

On the other end of the spectrum, intellectuals are increasingly becoming programmers, a merging of intellect and technique that Kropotkin would certainly approve of. Pierre Lévy, for example, went to night school to obtain an informatics degree while completing his work in social history during the day. Douglas Kellner has argued that there is an increasingly intimate relationship between intellectuals and technology:

> To be an intellectual today involves use of the most advanced forces of production to develop and circulate ideas, to do research and involve oneself in political debate and discussion, and to intervene in the new public spheres produced by broadcasting and computing technologies. New public intellectuals should attempt to develop strategies that will

[28] This has come also with an increase in the number of programmers who possess narrow technical skills, but not the professional skills needed to program within the corporate environment. "Paper MCSEs," those who are able to pass the exams required to become a Microsoft Certified Software Engineer but lack the experience to integrate this knowledge within a real world environment, have become a serious problem for institutions seeking out programmers.

> use these technologies to attack domination and to promote empowerment, education, democracy, and political struggle - or whatever goals are normatively posited as desirable to attain. There is thus an intrinsic connection in this argument between the fate of intellectuals and the forces of production. (1997)

This meeting of the intellectual and the engineer provides for a new kind of intellectual, one who can use and shape technology.

Veblen (1948) recognizes the position of *potential* power that engineers and technicians have. In *The Engineers and the Price System*, he suggests that they increasingly have direct control over the machinery that allows the industrial system to function. If there is to be a revolution, he insists, it will come from the engineers. He voices his extreme doubt that such an occurrence will come to pass[29], but lays out the mechanism of how it would proceed if indeed it did occur. His vision is of a centrally-controlled system, under the control of a rational plan that would allow for the effective distribution of work and of product. While his goal seems quaintly Leninist, especially given the fall of statist communism in most of the world, the means to the revolution are forthright. The technicians already control the lifeblood of the economy, a bloodless revolution could occur with a few weeks of effort. The only preparation needed is the organization of the engineers, and a public relations campaign for the mass public. Ironically, though he has indicated the potentially positive place of

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[29] "By settled habit, the technicians, the engineers and industrial experts, are a harmless and docile sort, well fed on the whole, and somewhat placidly content with 'the full dinner pail' which the lieutenants of the Vested Interests habitually allow them… They have, hitherto, been quite unreflectingly content to work piecemeal, without much understanding among themselves…" (Veblen, 1948, pp.441-442).

sabotage (i.e., different forms of work slow-down), he does not recognize the possibility of an invisible revolution, one which allows for small local changes that alter lived relations with technology. While these may eventually add up to large-scale structural changes, there are revolutions occurring now at a micro-scale.

This dialectic between the rebel and the technician is really overwrought: despite the popularity of the image of a group of grassroots rebel hackers fighting against the powerful monopolists (e.g., Jordan, 1999, p.215), in the real world some elements of both are present in most programmers. It is part of the hacker culture (and the cyberpunk genre) to work for a large corporation, and the "suits," during the day while moonlighting on a "real" project outside of work hours. The idea of moonlighting, like that of tinkering in the garage, are more iconic than literal. Many programmers work on open source projects while "at work" and work on corporate projects from home. Neither the temporal nor the physical boundaries of work are as fixed as they might have been in the past. The fact that there are no "pure" hackers nor corporate drones is an advantage. Having a foot in both worlds, computer professionals have the potential to fruitfully work to unite and divide, and have the ability to speak the language of the hegemonic culture and of the counter-culture[30].

[30] Raphael Sassower (1993, c. 5) makes a similar argument regarding scientists. He notes that scientists are often seen at one of two poles: either dominating the public discourse or failing to gain a foothold in policy discussions. He suggests a third path that makes use of both of these extremes, the role of the scientist as translator, encouraging understanding within the public and bringing this understanding to policy-makers. Edward Said (1991) noted in an interview that he too lived in both worlds, perpetuating

Driven by the ethic of inquisitiveness and novelty, situated hackers have the ability to create isolated disturbances in the hegemonic structure[31]. Just as the anarchy of the internet is intimately tied to the hierarchy of the business worlds, being able to exist in both worlds is a vital part of being a computer professional[32]. This role as translator carries with it both power and responsibility.

One of the reasons the hybrid nature of the computer professional provides an important bridge is that it allows for participation in government without becoming part of the uniform system. Concerns about creating a participatory democracy tend to focus heavily on ways of articulating citizens into the uniform system. That is, they tend to look for ways to overcome difference. The necessity of developing differentiation, the countervailing force of the community that Carey describes, is

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the status quo (by teaching the canonical texts) but situating them in a way that connects them to their historical and structural context.

[31] The laxity of the engineers that Veblen complains about does not seem prevalent among hackers, who do things "just for fun." (This is also the title of Torvalds's new book.) Richard Sennett, writing in the context of the revitalizing of the cities, notes that technologically driven abundance drives a certain sense of boredom, and the continuous disruptions of bored urbanites can lead to a form of low-level anarchy that allows for freedom from structures of authority. "Unlike Marcuse, I am convinced that affluence can be put to good ends, in a viable, enduring, anarchic society. I believe that the disgust and anxiety affluent communities presently cause in their young will make the people of this generation ready to explore the human unknown, and perhaps permit themselves to be hurt for the sake of preserving their vitality" (1970, p.188).

[32] "This miscegenation occurs almost everywhere within cyberspace. For instance, an on-line conference site can be constructed as a labour of love, but still be partially funded by advertising and public money. Crucially, this hybridisation of working methods is not confined within particular projects. When they're on-line, people constantly pass from one form of social activity to another. For instance, in one session, a Net user could first purchase some clothes from an e-commerce catalogue, then look for information about education services from the local council's site and then contribute some thoughts to an on-going discussion on a listserver for fiction-writers. Without even consciously having to think about it, this person would have successively been a consumer in a market, a citizen of a state and an anarcho-communist within a gift economy. Far from realising theory in its full purity, working methods on the Net are inevitably compromised. The 'New Economy' is an advanced form of social democracy" (Barbrook, 1998).

often left aside. Iris Marion Young regards the inclusion of minority groups as important to democracy, not inclusion by some arbitrary measure of common ground, but through "mechanisms for the effective representation and recognition of the distinct voices and perspectives of those of its constituent groups that are oppressed or disadvantaged within it" (Young, 1989). Young goes on to suggest three elements of such a mechanism: that there be some structure supporting autonomous fora in which disenfranchised groups could confer and reach consensus, that the decisions made in these fora would be communicated to decision makers, and that decisions that directly affect members of this group have "veto power" over the final decisions. Though Young goes on to further limit the scope of these groups[33], the mechanism as it stands provides a way for ensuring diversity while providing for a larger national or global community.

Part of what makes the work of the computer professional "magical" is that its mechanisms are presumed unfathomable by the lay person. This cult of expertise is often promoted by unscrupulous practitioners. Artificially reducing the number of qualified professionals creates a demand where there need not be one. The justification for such a demand can be traced back to the Hippocratic Corpus: "Things however that are holy are revealed only to men who are holy. The profane may not learn them

[33] She limits the use of such groups to those that are demonstrably not part of the majority. There are problems with such an approach, namely a very slippery slope. Once these groups are removed "from the bottom" of universalizing claims, what is to become of those who are the newly oppressed within the majority. Excepting the final element, veto power, allowing similar mechanisms for privileged groups would not diminish the process.

until they have been initiated into the mysteries of science." Modern science reacted against this shibboleth of the alchemists by enshrining the open, transparent, and "disinterested" (to use Robert Merton's term) pursuit of knowledge (Bok, 1982, c.11). Given the radical view that computer information should remain free, it may seem curious that one-upmanship is so prevalent, especially competitiveness that (whether playful or not) questions the intellectual capability of one's peers. The place of meritocratic competitiveness will be addressed in the following chapter—at this stage we may simply note that the process of radically open source code and information means that ability can be more openly judged, and often is judged harshly.

There is clearly, for example, a significant segment of Linux users and contributors who feel that there is no reason to make the computer easier to learn about. There are two possible explanations for this. Daniel Dennet (1986) provides the analogy of a violin—not an instrument that is particularly easy to play, but one that is capable of seemingly infinite innovation[34]. Linux allows for the same kind of flexibility in the hands of an expert. The less often self-professed reason for snubbing neophytes is that without other markers of status, one's ability to code and to understand complicated systems becomes one of the only marks of distinction. We should embrace the idea of the hacker in all of us, the capability of becoming playful master of the technology and not its servant. In *Technics and Civilization* (1934),

[34] Dennett provides this example in the context of expert systems, arguing that simple expert systems that spit out answers according to a set diagnosis will eliminate the need for an educated doctor, and could result in an overall reduction in medical knowledge, innovation, and practice.

Lewis Mumford traces the progressive encroachment of technology, and calls for its reversal. At some point, he hopes that the need for certain kinds of industrial technology will evaporate, and that people will put machines out of work. The only way this can happen is if people become generalists, and if technology is no longer a source of enchantment.

Organic Networks and the New News[35]

A group of computer professionals alone is not enough to effect significant change. Certainly these individuals, by acting within existing institutions, can influence how technology is used at a local level, but they will be unable to reach the two groups that are most important, those who need to be represented, and those who build policy. In order to do this, they must be able to rely upon the collaborative efforts of a "critical mass" of their peers, and they must have an organizational venue that provides access to a broad slice of society.

Over the last two centuries, communication technologies have historically been used predominantly as privileged organs of education, with content heavily influenced by advertising and other mass industrial processes. Ivan Illich notes, "They were pressed into the service of socialization. Periodicals expanded to accommodate all fit news, which meant that a few professional journalists got vast readerships, while the

[35] I am cognizant of the use of this term for earlier "new newses," including television tabloids and talk radio. It does, however, capture the idea presented, which is that news is once again undergoing a shift.

majority was reduced to token representation in the 'Letters to the Editor' section" (1973, p.69). Illich's claim is not that the technology alone is at fault; the alphabet, the printing press, the tape recorder, and the camera he sees (following on Mumford) as technologies that allow for personal creativity and expression, when used within the right context. When combined with social structures that allow for the "manipulation" of these media by a powerful group, and a system of schooling that molds citizens into accepting and eager audiences, these technologies are used to dehumanize the mass. Roszak describes the same path for the microcomputer: from individual tool to mass medium. Is it possible to reverse this process, to demystify the new systems of internetworking, to redistribute the power to the peers?

Langdon Winner's view is that information alone is not an adequate response to the disempowerment of the audience. More information need not relate to more interest or action. He further argues that even the improved communication of information among individuals is not alone a match for the use of computers by media giants, big business, and the government. He provides the example of the distribution of firearms as a check on authoritarian governments, and provides the military defeat of the Paris Commune as a refutation of such arguments. The same is true of the personal computer: "Using a personal computer makes one no more powerful vis-à-vis, say, the U.S. National Security Agency than flying a hang glider establishes a person as a match for the U.S. Air Force" (1991, p.168).

How do we reconcile such a view with the success of the Zapatistas, and of those who have followed their lead. They have fought a relatively bloodless insurgency that has led to international recognition and pressure. Though certainly not an unqualified success, other movements that have not leveraged the information networks have not done as well. The difference is not solely in the technology, but also in how individuals are able to use networks of computers to form their own organizations, organizations that are dynamic and highly interconnected; organizations that, to borrow Ronfeldt's (1998) term, are capable of "swarming"—though it should be noted that networked approaches to studying social movements have been useful well before the internet came into widespread use (Diani, 1992). It may be true that the "loan gunman" has little chance against the well-armed state. However, guerilla tactics that rely on strategic organization of forces have proven successful against numerically and technologically superior enemies. Moreover, as global organized crime has demonstrated, a collection of people can exploit the jurisdictional freedom of cyberspace to circumvent the legalized violence of any given individual state (Kerry, 1997). This requires a way of creating conversation among groups of people large enough to make a difference, inventing new ways of allowing for discussion to take place among thousands of people, and creating pathways for such large-scale interactions to expand. The difference between success and failure is not about

technology alone, but about how that technology is applied within a group, an organization, a community.

Computer professionals, when they work together, are capable of creating communities of discourse that can both actively create political change and inspire others to similar paths. For their task to be successful, a technological-organizational structure must be employed, a structure that allows for the creation and maintenance of a convivial community. We need the equivalent of the American town hall or Habermas's coffee house writ large, a communicative and organizational architecture that will allow for open discourse. This place was, from the industrial revolution, fulfilled by the newspaper.

Keith Stamm, in *Newpaper Use and Community Ties* (1985), establishes a framework for measuring various forms of community ties and how newspaper circulation affects and is affected by those ties. He follows the work of Park, who (as a student of Dewey) saw newspapers as serving the function of reintroducing the community to urban life, and constituting an "integrating mechanism" for the community. Stamm contrasts this with Merton's view that the ties precede the flow of newspapers in a community, and concludes that both Park and Merton were correct, and that the relationship is reciprocal. At the close of the book he highlights some of the continuing changes in communities, notably that they are increasingly intentional,

that they place a premium on knowledge management, and that they will need to find a way to share values.

These three criteria are equally important for our electronic environment. Unfortunately, as many have noted, the traditional newspaper has not been particularly effective in this regard. The idea of news on the web has, naturally, both its detractors and its fans. Those who doubt its use as a news medium note that it is lacking in the objectivity and fact-checking available with traditional newspapers, and point to the technological superiority of newspaper (portability, readability, navigability, etc.). Those in favor of it often speak to the concerns we have encountered above, and promise that:

> Digital news differs radically [from traditional newspapers]: no other medium has ever given individual people such an engaged role in the movement of information and opinion or such a proprietary interest in the medium itself. The computer news culture fosters a sense of kinship, ownership, and participation that has never existed in commercial media. (Katz, 1995)

Despite Jon Katz's enthusiasm for the medium, very few news outlets on the internet come even close to matching these characteristics. One of them happens to be a site on which Katz is a frequent contributor, Slashdot.

Though forms of synchronous and asynchronous communication systems were available nearly from the beginning of timesharing and computer networking, one of the first that could be said to be a community was a system designed by those involved in the Community Memory project (Levy, 1984). Like many projects in and around

Berkeley and San Francisco at the time, CM wanted to bring computing to the people. They felt that the machine could be used against bureaucracy instead of just to support it. Early projects placed a machine in a public location, next to a physical bulletin board. It was quickly used as intended, as an instantaneous, searchable replacement for the kinds of messages found on the board. It also grew to include poetry and political writings. Though the project lasted only a few years (from 1973-1975), it had an enormous effect on those who were exposed to it. It provided an important first step in using the computer to build non-hierarchical community networks. It allowed those who were part of a community to converse in a new way:

> Community Memory… is *convivial* and *participatory*… A CM system is an actively open ("free") information system, enabling direct communications among its users, with no centralized editing of or control over the information exchanged… Such a system represents a precise antithesis to the dominant uses both of electronic communications media, which broadcast centrally-determined messages to mass passive audiences; and of cybernetic technology, which involves centralized processing and control over data drawn from or furnished to direct and indirect users… The payoff is efficient, unmediated (or rather self-mediated) interaction, eliminating roles and problems that develop when one party has control over what information passes between two (or many) others. The freedom is complemented by the way the system democratizes information-power, for no group of its users has more access to its main information than the least user does. (Michael Rossman, quoted in Roszak, 1986, p.140, original italics)

This open architecture for building networks allowed the user to define the technology. They certainly were not programming the system, many of those who participated would not have had any inclination to do so, but because the social

architecture was left undefined by the system, it could be used in any way the participants wanted.

CM was based on an existing community, and provided space-based access to a network to help build communicative ties within the community. It served as a prototype for larger community networks like those in Blacksburg, Virginia and in Seattle. The systems that eventually would come to be called the Internet were envisioned, from early on, as a way for communities to collaborate on-line. In 1968, Licklider and Taylor (1990) wrote "The Computer as a Communication Device," in which they predicted not only the national growth of networking but the eventual emergence of virtual communities: "What will on-line interactive communities be like? In most fields, they will consist of geographically separated members, sometimes grouped in small clusters and sometimes working individually. They will be communities not of common location, but of common interest." The impact of these communities on the society at large would be "good or bad, depending mainly on the question: Will 'to be on-line' be a privilege or a right?"

It would take more than a decade before the first application of his ideas would take hold in a significant way. Among the first successful "very large-scale conversation" systems (the term used by Sack & Dumit, 1999) was the Usenet system. Certainly, earlier systems had been successfully used throughout the 1970s and beyond, but soon after Usenet was implemented in 1979, it began winning a large

number of adherents (Hauben, 1997). Unlike many earlier systems, Usenet required only access to the internet for someone to join a group or to start their own. It drew in millions of people who were looking for information, collaboration, and recreation (Sproull & Faraj, 1996). Though the growth of Usenet and MUD/MOOs have subsided, they are still often seen as "typical" forms of interactive discussion, and remain the subject of many studies on large-scale conversation. Particularly because of its massive scale, dwarfing smaller private discussion boards, Usenet is frequently examined in order to better understand how people navigate large-scale conversations, and to help design tools to better understand these conversations.

This movement toward collaborative communities was quickly overtaken be a very different application of internetworking during the early 1990s. The World Wide Web, for the first time, made computers look much less like computers and much more like television. The process of reading and browsing the web was easy enough to be self-evident, and while getting a computer hooked up to the internet and installing browsers was (and is) not always an easy process, the process of "surfing" was far easier to learn than was the activity from which it borrowed its name. While the penetration of the internet in the developed world has been very rapid, relatively few consider themselves part of an online community or regularly participate in large-scale conversations. They may be active on an email list that serves a few dozen or even several hundred, but by-and-large, they are passive receivers of information, unwilling

or unable to contribute back to the conversation.

The web was and for the most part remains a static publishing medium. Until recently, interaction on the web has been by necessity very limited. Changes in the technology that drives the web—processing on the client-side like applets and plug-ins, or on the server side with CGI, database-driven sites, and ASPs—have made the web more dynamic. It has also made it possible for earlier forms of computer applications to be made available over the web. Hotmail is a good example of this: email is increasingly being "imported" into the World Wide Web. The same is true of Usenet, which is now available via the Google search engine both for reading (including an archive going back as far as 1995) and for posting. As noted in the previous chapter, there has also been a recent influx of systems that allow for easy publishing to the web, including guest books for web sites and simple discussion systems. These early, simple systems have led to more comprehensive database-driven discussion software, like ASP-driven discussion boards (e.g., *infopop.com*) and blogs (e.g., *blogger.com*).

How does Slashdot, a collective blog, stack up against the new characteristics of communities described by Stamm? First, the architecture and processes should be capable of attracting those who share similar interests. That alone, however, does not define an intentional community. Individuals must both share interests and be willing to enter into a community, accepting both the benefits and the responsibilities of being

a member of that community. And while those who participate in the forum should share some basic values that allow them to relate, there should also be enough diversity to stimulate debate. This is the worry of a number of recent commentators, including Andrew Shapiro, and the topic of a new book by Cass Sunstein called *Republic.com* (2001). Both suggest that the communities formed on-line, because they can draw from such a large base and because filtering is so easily and accurately achieved, lead to an attenuation and polarization of views. As we shall see in the following chapters, while there is certainly a diversity of opinions on Slashdot, there are clearly limits to the range of acceptable debate. While both the form and content of these debates are at odds with what is often found in the "traditional" media, they are also not as wide-ranging and diverse (both in terms of participants and ideas) as they might be.

How well does Slashdot work as a system of knowledge management? Those who run the site steadfastly claim that it is not a source of news and information, but even a cursory visit to the site makes clear that it is as much designed to help educate and build knowledge as it is to provide an amusing source of discussion. Knowledge is built in two ways. First, Slashdot relies on members of the site to provide sometimes obscure information for the community. It therefore plays an interesting role in the larger environment of the world wide web, funneling interest to areas of the web that are usually not visible to the casual surfer. Second, through the process of

argumentation over particular topics, users provide further sources of evidence for their position. Both of these sources of information are often linked to trails of related web sites and discussion topics, providing the kind of depth that is not as easy to find elsewhere on the web, and a good example of Vannevar Bush's (1945) "associative trails" of information.

Finally, for Stamm, there must be some way of sharing values. In the following chapter we will see some examples of what is valued among "Slashdotters." The ability to grade one-another's posts provides an immediate indication of what is and is not valued among the readers of Slashdot. Moreover, those who participate in the discussions often slip into meta-discussions regarding the process of deliberation, the values of the community, and the like. This socialization process may be the most important element in making Slashdot a community of sorts.

In additions to creating a community, to be an effective counter-hegemonic force, Slashdot needs to be more than "just" a public space. It must connect in some clear way to those who are not computer professionals: those who affect policy and those who are affected by policy. There are a number of ways this could be charted. In chapter four and five, a description of how Slashdot is linked to the wider web is attempted. While imperfect, this does provide some indication of the flow of information outside the walls of the Slashdot site. In chapter six, the history of

discussions regarding intellectual property on the Slashdot site is provided, along with the ways in which this has linked to both traditional media and to the policy process.

Slashdot does not represent the only attempt to once again flatten the hierarchies that have evolved around the internet. These hierarchies have begun appearing due in large part because of the encroachment of big business, and more recently national governments. It is hard to ignore the predominance of traditional media, especially on the World Wide Web, but there are other examples in which the producers and the consumers of the information are the same people. Peer-to-peer (P2P) and agent-based systems are thought to be the "next big thing." Napster, Gnutella, and Instant Messaging are all examples of internet applications that once again reduce the influence of moneyed interests upon the communicated content and the networks of communication of the internet. The question is how long this is likely to last. Most likely, as with earlier innovations, it will eventually become a source of distortion and concentrated control. As Peter Kollock has warned, "it is crucial to avoid empty-headed extrapolation from current success [of open source projects] to utopian visions of fully cooperative communities" (1999, p.235). But if there is any hope of a quiet revolution, it is the hacker ethic and a community of computer professionals who will cast aside their élitist tendencies, and instead take on the larger role of bringing the power of computers back to the people.

Summary

In the previous chapter, it was suggested that Slashdot was not just a discussion site *for* the open source community. Instead, the ideas that surround open source are fundamental to the Slashdot system. In this chapter, we have seen that the combination of a class of enlightened technologists in combination with a system for open conversation provides the potential for a re-invigorated public sphere and a more democratic society. It should be noted that although this remains a potential, and a very exciting one, it is by no means a *fait accompli*. On the contrary, the more likely scenario is that computer professionals will increasingly become specialists, reinforcing the existing hierarchies of control. However, Slashdot and the open source movement hold out the promise that some subset of these computer professionals may become computer intellectuals, and that this might lead to a more just society.

The following chapter takes the more abstract ideas of this and the preceding chapter, ideas about the culture of Slashdot being a part of what makes it work, and attempts to discover evidence of this in the text of conversations on the site. This approach represents a "bottom up" study of Slashdot—one that relies upon methods normally used with much smaller conversations. Nonetheless, it shows that the ideals of open source play out in the communicative patterns of "Slashdotters."

Chapter 3:

Karma Whores, Trolls, and Anonymous Cowards

> "The open-source movement, if nothing else, is an effort to recognize the value of differing opinions, needs, thoughts, and the strength of humanity – so show some."
>
> – Slashdot Contributor

Discourse provides some indication of the structure, the values, and the collective purpose in any community. In an on-line community, the derridian ideal is achieved and nothing exists outside of discourse[1]. Earlier chapters provided a context for Slashdot. As a web site, the Slashdot system allows a very large number of people to participate in a discussion. This may seem like a simple thing, but it is quite profound. While the formal aspects of the web site are doubtless important to the success of the Slashdot model, more important is the community structure. This chapter attempts to uncover some of the dynamics of that structure, by looking at indications of the characteristic user of Slashdot, the range of topics covered, and the typical forms of interaction. It is by no means an exhaustive study of the conversations that take place on Slashdot. It is instead an attempt to come to terms with the way in which users interact with the board and the community, and what this might mean for the content of the board.

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[1] This is not, one might note, strictly true. The representative actors are all constrained not only by their physical environment, but by their position in a historical hierarchy. One could say that these hierarchies also describe the *relationships* among those who are able to participate on Slashdot, but once the hurdle of access is crossed, the processes of inclusion and the relations with others who use Slashdot is almost entirely textual. As the famous New Yorker cartoon claimed, on the internet "no one knows you are a dog."

Writing in the period just before Slashdot came into being, John Streck (1997) postulated that the community of the WELL could never be extended to the anarchy of Usenet. There was no way that more than a few thousand people could engage in conversation, and especially cross-topic conversation. Slashdot is a viable attempt to address this problem (Kim, 2000). This is not a perfect system, but through both its strengths and shortcomings it presents an opportunity for looking at how architectures of discussion interact with social structure. Beyond this, because Slashdot represents an important segment of the population of computer professionals, it allows us to examine interactions for an indication of what is valued and the limits of what the community finds acceptable and worthwhile. While a hacker ethic and culture may exist in the rhetoric of those who have appointed themselves social critics, examining the discourse of Slashdot provides us with some evidence of shared ideals.

The following pages are intended to provide a sketch of the *style* of discourse on Slashdot, to arrive at some assessment of how it may be useful—both from the perspective of the users and from the perspective of the society—and discover in what ways it fails. While a more detailed textual analysis would be interesting, it would help only marginally in finding the social role of Slashdot. Rather, we need to understand the ways in which the social and technological structures of Slashdot shape debate, and how a particular set of beliefs and behaviors have evolved in the Slashdot

environment. In the following pages, answers to the following questions are attempted:

- Who are the Slashdot users?
- What is the discursive style of comments?
- How are users socialized to this style?
- How is consensus reached?
- What remains unsaid, and what biases seem to be inherent among the comments?

Methods for studying new media texts are still in their infancy. It what follows, I have been "shamelessly eclectic" in my use of qualitative and quantitative data (see Rossman & Wilson, 1994). While the first section includes some quantitative content analysis (especially of the quantified scoring of Slashdot messages), the remainder relies on the qualitative methods used most frequently in framing analysis and anthropology: an adaptive system of tagging messages read. Every posting from 1 November 2000 to 1 February 2001 was examined (a total of 1134 topics) and all *topics* before and after this period were read (but not all responses). The author did not post to Slashdot during the period of study, in the hope of retaining as neutral a stance as possible (Paccagnella, 1997), though he did moderate on two occasions, in order to better understand the process.

What Slashdotters Say About Themselves

What we can discover about those who participate on Slashdot comes mainly from how they represent themselves on the site. Is it possible, using this and other indications, to form a picture of the community of Slashdot users? Any picture we do construct will be strongly colored by the users' outward identities. As with any public discussion, we cannot expect participants to reveal too much about themselves. One might even argue that such personalized information might hinder discussion, and that the fact that discussions on Slashdot are generally absent from serious *ad hominem* attacks, with the notable exception of insulting the intelligence of a previous poster, may have to do with this lack of personally identifiable information. Throughout this chapter, we will be looking for clues that indicate what Slashdotters think; one of the best places to start is by looking at some of the rare outside views, and what Slashdotters think about *themselves*.

With what can we compare these self-portraits? A site that receives a million hits every day, according to the FAQ, is likely to have a large audience. To get a feel for that interaction, though this will become more important in chapter six and is only tangential to the topic at hand, we can see how newspapers (as an example of a "traditional" media) portray Slashdot. While newspapers still need to explain in a few words what Slashdot is when they write stories for general audiences, in part because of the "Slashdot Effect" on traffic to small sites, many of those who have never seen

the web site know what it is. From 1998 to 2000, the *New York Times* (which is known for its fairly thorough coverage of information technology) mentioned Slashdot in a total of 22 articles. Some print sources of technology news like *Wired Magazine* were mentioned by the *Times* more often (in 85 articles), as was the *Red Herring* (33 articles) and *The Industry Standard* (249 articles). Slashdot was mentioned far less than the most popular web sites, including *Amazon.com* (1,496 articles), *Yahoo!* (1,440 articles), Ebay (864 articles), MSNBC (598 articles), or Priceline.com (343 articles), but about as frequently as some sites that draw significant traffic, like Discovery.com (20 articles) or Salon Magazine (27 articles)[2].

Most often the articles in the popular press that make mention of Slashdot do so only in a cursory way. Except for the first mention in a *New York Times* article in early 1999 (Riordan) that parenthetically explained what Slashdot is ("**,** an Internet site… that proclaims itself as specializing in 'news for nerds,' …") and a short article later that reviewed the Slashdot site (Biersdorfer, 1999), most articles define the site very briefly (as, for example a "technology website," or as a "pro-Linux" site), or simply use the name of the site without any description. Several of these articles cite Slashdot as a source for comments, contacting named posters via telephone for confirmation (see Riordan, 1999 and Feder, 2000; unattributed comments on Slashdot appear in Wayner, 2000; Guernsey, 2000; and Schwartz, 2000). Beyond the *New York*

[2] Lexis-Nexis full-text searches.

Times, references to Slashdot are plentiful. *The Guardian* was among the first newspapers to take notice of the site (in 1997), and named it one of the top ten sites of 1998 (Naughton). A series by Jon Katz called "Voices From the Hellmouth," which discussed the cruelty toward Goths and other socially ostracized youth after the Columbine shootings, make up a significant number of the newspaper articles about Slashdot. Others place Slashdot as a counterpoint to official pronouncements from Microsoft.

The view of these newspapers is clearly that Slashdot represents a rarified community of technology professionals. As one article in *The Guardian* put it, Slashdot is "the place where the IT industry's insiders, and would-be insiders, discuss the latest technical news. If your company's Internet team read Slashdot**,** they're probably pretty good at their job. However, they won't have much time to do anything, because they probably spend their whole day reading and sending messages to Slashdot" ("The Search Engine," 1998). Getting at who posts and participates on Slashdot is a bit more difficult.

One possible source of information is the periodic automated web polls. Like any web poll that is open to users these cannot be treated too seriously, and they are not treated seriously on the site[3]. However, just as with the postings on the site, they do give us some indication of how Slashdotters wish to collectively portray

[3] A caveat on each poll reads "This whole thing is wildly inaccurate. Rounding errors, ballot stuffers, dynamic IPs, firewalls. If you're using these numbers to do anything important- you're insane."

themselves. To the question "My gender is," 82% responded male, 5% responded female, and 11% responded "Somewhere in the Middle"[4]. In another poll, 29% claimed to be students (32% and 41% in earlier polls), while 22% worked for large corporations. Responses to a poll on age fell mostly within the 18-23 bracket (37%) or the 24-30 bracket (31%). 22% reported themselves as married, 23% as "significantly involved." 74% said that they thought of themselves as programmers, the remaining 26% did not. 60% reported that they live in North America, 30% in Europe, with the remainder on other continents.

We could dismiss these polls entirely were there a better way of discovering who uses the board. A survey could accomplish this, but Slashdot contributors, while cooperative on many projects, express very strongly their dislike of spam (unsolicited emails). To respect the wishes of the Slashdot community, any survey would have to be anonymous and would, most likely, require a self-selected sample. Such a survey would be flawed by design, given that there are no reliable demographics available for the community.

A more open-ended approach would be to look at the self-descriptions Slashdot users provide when they sign up for the board. To that end, 300 users were selected at random from those who had posted during November and December of

[4] 56,260 votes were cast. The last option was (perhaps) intended as humorous, as the last option usually is in these polls. However, it turned to a discussion of both the gender bias among the readers of Slashdot and the general acceptance within the hacker community of alternative lifestyles.

2000[5]. Of these, 52% provided no additional information whatsoever, and another 6% provided only their email address[6]. Many explained they did not want to provide information. For example[7]:

- I choose to remain ambiguous about my personal statuses.
- You can't send any email to me because I have totally given up emails. I am so fucking tired of spam so I don't use emails anymore.
- Bah! No bio! Well, OK. If you really must email me, here's my email address (slightly buggered up:) phillips75 AT usa net[8].

Many provide short self introductions. Most of these make an attempt at wit or humor:

- Dangerous twisted, free-thinker with blue-hair!
- I AM. That sums up all of me in 2 words. I am 20.

[5] A note on access to the Slashdot archives: Slashdot posts are held in a database for several months after they are posted. These posts can be accessed dynamically, re-sorted, filtered, and the like. After this period, they are converted to static html pages. These pages are in flat (non-threaded) format, and any –1 moderated posts are eliminated. A complete archive of posts was requested from Rob Malda, one of the pair who founded Slashdot, but he was unable to provide such a record (personal email, 2000). However, nearly all the posts made from the very earliest days of Slashdot are available over the web and Altavista has indexed most of these. Some of the earliest posts have escaped Altavista's search engine, but the index is nearly complete from 1999 on. This allows for posts to be searched by day or by topic.

[6] All but one of these email addresses were protected against spam in some way. One, for example, had provided his email address in reverse. Others had inserted "nospam" into their address in various places that would have to be removed before sending.

[7] I have wrestled with protecting the privacy of those contributing to Slashdot. In a later section, when I have done significant linking of messages that would otherwise not have been linked, I provide further pseudonyms to a set of individual posters. However, given the public nature of the site, there is really very little expectation of privacy. Indeed, these comments demonstrate the degree to which participants already protect their own privacy. This view of a public forum as akin to "tombstone epitaphs, graffiti, or letters to the editor," as Sudweeks and Rafaeli (1996) have noted. The last of these is a particularly applicable metaphor.

[8] This email address has been further altered.

- Bagel is an computer security enthusiast as well as an avid programmer he has a knack for electronics and spaghetti sauce.

- Elvis impersonator/stripper

- Barry was raised by wolves.

Others are simple, brief self descriptions:

- Currently an NGO whore in Washington DC.

- oh, to be independently wealthy. well, it sounds nice anyway, but until then, i'm a full-time student / full-time systems analyst. and at home, i'm hopelessly addicted to about a dozen little projects. ah, to have a selectively long attention span!

- I am a 14-year-old that has occasionally been accused of writing code. Your usual geek-style stuff: Hates echelon, reads /., is a Linux bigot, etc. You get the point.

- Geek by day, raver by night. Don't play chess, play go. Are we heading toward Jihad through McWorld?

Two have provided their "geek codes." Geek codes are a humorous attempt to encode in an abbreviated way the characteristics that are the best indicators of "geekiness" (Star, 1995, pp.11-20; http://www.geekcode.com). For example, the following code was provided in one bio:

```
Version: 3.1 GCS/E d-(+) s:- a->? C++>++++ U(++) P L+>+++++ E-
W+ N++ o K++ w+(---) O M+ V PS+++(---) PE+ Y+ PGP- t* 5++ X++(-
) R* tv+ b+++ DI+++ D++ G e++/++ h r--(---) y--(**)
```

Which claims, among other things, that the contributor is a slightly underweight 25-29 year old, tends to wear jeans and a t-shirt or something slightly more formal than that, considers computers a central part of his life, uses the web infrequently, generally

avoids Emacs and Perl, has a Macintosh and uses it fairly often, has very broad political positions, and while is concerned with privacy issues tends not to be very vocal on political issues. The axis along which the geek code is established (technical proficiency, knowledge of Star Trek, political beliefs) provides some indication of what it is to be a geek, and how that has evolved (it has been about five years since the last update of the code). About five percent of the bios included their PGP public key or a link to it. Presumably, others who have provided their email addresses (or some masked form of it) may have public keys available on key servers.

Of those biographic pages in the survey, 34% provided a link to a home page or another page to which they had contributed. In 24% of the cases, this person could, either through the bio or the linked pages, be associated with what appeared to be their "true" name rather than a pseudonym. Of the 21% for which a home location could be ascertained, almost half (just under 43%) were from outside the United States. The most frequent countries listed as home besides the US were Canada, Norway, the UK, Denmark, and Germany. Of the cases in which it was possible to ascertain the occupation of the participant, nearly two-thirds were students. This was often in addition to working full or part time, and when a major was mentioned it was overwhelmingly computer science. Two webpages indicated the author was a high school student, and three indicated they had earned a Ph.D. in the sciences.

Unfortunately, as noted, a more thorough investigation of the makeup of the community is a difficult undertaking. On the other hand, even this very rough picture gives us some indication of the range of participants. In some ways, it is very narrow. Most are technologically savvy, the vast majority are male (as they are in the IT industry and in computer science departments), and self-identify as "nerds." On the other hand, the discussions represent a number of nationalities, levels of education, and political perspectives.

More important, perhaps, is that for a majority of those who participate, no further information is available. This could be a good or bad, from the perspective of promoting a public exchange. On the negative side, there is nothing to stop PR flacks from planting "buzz" on-line[9]. While Slashdotters tend to be a cynical lot, an artful plug is likely to get through. On the other hand, this conforms to Habermas's public sphere almost as well as it diverges from Rheingold's virtual community. Participants are likely to discuss issues in a forum that is relatively free of partisanship, but are unlikely—to use an example of Rheingold's experience on the WELL—to provide medical information for an ill child (1993, p.17). Indeed, since even domains and email addresses are easily and frequently concealed the playing field is further layered.

[9] CmdrTaco (Rob Malda) sarcastically commented on this as part of the commentary on an article on artificial buzz: "Wierd, huh? I'm equally annoyed by websites with fake personalities that run them. Like Hemos- he's really written by a team of marketroids ;) I'd like to state for the record that Rob is not Bill Gates. Honest" (http://slashdot.org/articles/99/07/16/2155259.shtml).

Other markers of class, education, and background, including writing style and the "sigs" (signatures which usually consist of a pithy saying[10]) that have been noted on Usenet and email lists remain visible markers on Slashdot (Jordan, 1999; Donath, 1999). In particular, though some linguists have suggested that language difference within speech communities is not usually enforced overtly in networked society (Chambers, 1995, p.67), the norms of spelling and grammar are frequent topics of critique. Such critiques are rarely moderated up—as they are seen as unimportant[11]—but that some readers find it important to correct their fellow Slashdotters indicates a form of hierarchy defined by writing style, at least in the minds of some. These forms of identity that are attached to the Slashdot "avatar"—that is, a consistent face that is constructed for the Slashdot community—produce a forum in which some voices are held to be more important than others. This cultural norm is reinforced through the application of the karmic system. Slashdot manages to walk a line, one that allows for a degree of diversity not found in many smaller on-line contexts, while enforcing a set of behavioral and attitudinal beliefs among its participants.

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[10] An investigation of the sigs used on Slashdot is not provided here. Unlike email and Usenet posts, sigs are very short (must be less than 120 characters) and are present in only about half of the posts. These are usually short sayings that reflect the cleverness of the author. Many are mottos (a number of which are in Latin), some are famous quotes, some are paradoxical statements, some advertise a home page or project, and some explain how to decode a "de-spammed" email address.

[11] Some have gone so far as to suggest that an additional comment class be added to the moderating downward menu: "Pedantry, -1." This would apply mainly to issues of spelling and grammar, though there are other instances in which pedantry has been attacked.

Learning the Ropes and Karma Whoring

The technology that drives Slashdot aims to push toward consensus in both the short and the long term. In the short term, the discussion of a particular article is likely to reach a steady state of preferred opinion over a period of several hours, due both to the discussion itself and the moderation system. In the long run, there are a set of beliefs and behaviors that have evolved that give the discourse on Slashdot its distinctive character.

Unlike some other on-line forums, including the original bulletin board systems, Slashdot has a built-in mechanism for finding out what the community thinks about a certain viewpoint. Many social systems are built upon the threat of expulsion for those who violate community norms, and Slashdot is no different. Those who meet with the approval of the large Slashdot community will eventually have their posts raised to a score of five, those who comment but are unremarkable are left at a score of one, and those who violate the norms of the social system are dropped to zero, or marginalized entirely by being dropped to negative one. While they are not eliminated by being dropped to this level, the FAQ suggests that users set their filters at a level of two or three so that they can read only the best comments. If a particular thread intrigues them, they can always dig deeper into that thread and see comments that have not been as highly rated, but this becomes a choice rather than the default.

Particularly for the many "lurkers" (those who read but do not post), those messages that attain higher ranks are seen as being the "winners" of the discussion.

One would assume that by examining the posting histories of individual users, it would be possible to discover, as they do, what yields a coveted score of five and what does not. With tens of thousands of active participants and thousands of posts each day, it is easy to lose the individual. We can, however, attempt to uncover the history of some successful posters. Sixteen Slashdotters were selected at random from

*Table 3-1. Characteristics of sample posters. (See text for explanation; * $p<0.05$.)*

Name	User ID #	# Posts	Mean Score	*R*	Suggested?
Andrew	2,xxx	33	1.4	.01	✓
Bruce	6,xxx	132	1.9	.41*	✓
Charles	18,xxx	41	1.9	.51*	✓
David	27,xxx	20	2.3	.66*	
Edgar	28,xxx	67	1.4	.31*	
Francis	69,xxx	95	2.1	.12	
Gerald	100,xxx	25	2.2	.16	
Harry	111,xxx	29	2.0	.25	
Ian	114,xxx	43	2.6	.15	
Jessica	136,xxx	20	1.4	.10	✓
Kelly	142,xxx	7	1.4	.20	
Larry	151,xxx	86	1.1	.25*	
Mike	177,xxx	71	1.5	.18	✓
Nate	203,xxx	52	2.4	-.14	

those who received a +5 score during the first ten days of December, 2000. For one of these posters, it was apparently their first post, and for another, only a single previous

post existed[12]. These two were removed in order to get a more complete view of the learning process. Table 3-1 lists some of the characteristics of the remaining 14, including the ID number (to the nearest 1,000), the number of posts before 1 December 2000, the average score of all posts before 1 December, the correlation (Pearson r) of post number to score, and whether the participant had ever had a story they suggested become a topic on Slashdot.

Unfortunately, as the table demonstrates, showing a correlation between posting experience and the score of those posts is difficult. Of those correlations, only five are statistically significant, and one shows *negative* correlation—that is, for one of the participants, more posting experience led to *worse* scores from the moderators. There are other factors as well. Had the post that scored a five in the early part of December been included in this analysis, four more of the participants would have shown a statistically significant increase in posting scores over time. However, it should be also be noted that these participants were picked because of their ability to create a post that received a +5 score, which meant that they were among the most successful Slashdotters.

Finally, some of these correlations were undoubtedly helped by the "Slashdot posting bonus." As noted in chapter one, those who are registered and post regularly to Slashdot accumulate "karma," a certain number of points based chiefly on how

[12] This alone may be a refutation of the idea of socialization. However, it may just be that they posted on areas in which they were experts and may never post again, or that they had been lurking long enough to have the basics down.

moderators treat your postings. After a certain number of points are collected (although this is not documented, the break point appears to be a karma of 25), the poster receives a +1 bonus when posting a new message; instead of new posts starting off at a score of 1, they begin with a score of 2. This is important because it makes the post more likely to be seen by readers and by moderators. It also means that scores are likely to increase over time, even if the quality (as judged by the moderators) has not. Though this is not visible for most of the Slashdotters in the sample used, it is very clear (perhaps because of the large number of posts) in the history of Bruce's postings (fig. 3-1). While there is clearly an overall increase in the score of posts over time, the jump (around post number 60) from mostly scores of +1 to mostly scores of +2 is easily detectable, and likely a significant contributor to the high correlation found in table 3-1.

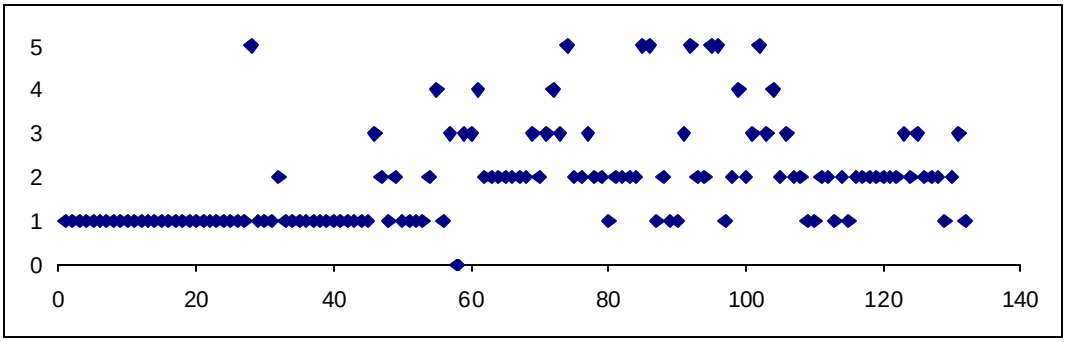

Figure 3-1 – A plot of scores for messages posted by Bruce before 1 December 2000.

Given all of this, we are left with the conclusion that even among the most experienced and highly valued posters on Slashdot, the ability to consistently produce highly moderated messages is slight, at best. In fact, it seems that for some of the newest members, posts decrease in moderated score as they become more comfortable with the medium. This can even be seen in the plot of Bruce's postings. After receiving the +1 boost, many of his posts are moderated up, but a number of them are also moderated downward. In order to understand why this might be, we need to turn to what the Slashdot community calls "karma whoring."

Those who post messages are not expected to do so explicitly, or strategically, with the intention of receiving a high point count. Some complain that one of the system's faults is reinforcing dogmatic positions within the community. Those who, for example, link Linux to any topic in the hopes that moderators will "mod them up" are often referred to as "karma whores," jargon that (like the "Slashdot effect") has gradually spread and is now used in other forums. Karma whores manipulate the system in an attempt to attain better karma. The views on the process are mixed. On the one hand, some see this as driving divergent ideas to the margins. On the other, it is often successful in its original intent: boiling down several thousand messages to those of the highest quality. A fan of Slashdot has created the "Slashdot Beastiary" and has this to say about karma whores:

> The most readily apparent distinguishing characteristic of a seasoned Karma Whore is the automatic +1 added to his posts. Armed with

> useful literature, informative links, a sprinkling of wit, and the people-smarts of a master PR exec, the Karma Whore descends upon a discussion to dole out his knowledge and enlighten the masses. And, oh yes, scoop up a +5 in the process. If a Karma Whore expresses an opinion, it is usually the most popular one; anyone who disagrees risks being moderated down as Flamebait. If Trolls are the Slashdotters you love to hate, then Karma Whores are the Slashdotters you hate to love. You know damn well they're only posting to get those precious points, but they know what they're talking about and all too often, you actually find their posts useful and informative.
> (*http://www.cybernothing.org/~holychao/karmaho.html*)

This ambiguous attitude toward karma whores is prevalent. There are also those who act as the "trolls" (who post intentionally incorrect or incendiary messages) and groups of trolls have their own forums in which they discuss the best ways to sneak in a false, misleading, or incendiary post without having it immediately moderated down.

What does karma whoring have to do with the gradual evolution we see in Bruce's posts? For one possible explanation, we can turn to a definition of karma provided on Everything2[13]: "Karma on Slashdot only matters until one reaches the bonus stage. There is no real point to karma whoring after that, because the only person who ever sees it is oneself—hence, it only serves to salve one's own ego"[14]. That is, after a certain probationary period in which you show that you are capable of posting good material, you no longer have to be bound (at least not to the same degree) by the strictures of peer-moderation. This might apply even to those who are

[13] Everything2 (*http://www.everything2.org*) began life as an extension of Slashdot. It provides a self-organized venue for posting definitions and other information. While its intent is to cover "everything," it does so from a particularly cultural perspective, an ethic shared with Slashdot. Occasionally, Slashdot provides small links to Everything2 for definitions of terms that are unfamiliar.
[14] *http://www.everything2.org/index.pl?node_id=514877*

not able to reach the bonus, but decide to continue posting without paying much attention to the scores.

If this is the case, we should still see improvement in the earliest stages of posting. The first 15 posts of each of the sampled posters was compared—in the case with less than 15 (Kelly), the original posts were used, and in the cases where a post was not moderated up within the first 15, the range is extended to the point at which the first up or downward moderation took place. Table 3-2 lists the results. There are clear changes, especially among those with low and negative correlations in the longer term. Note that because of the smaller number of data points it is difficult to infer a relationship in these correlations (at least without combining the cases). However, they are consistent with a qualitative view of the first 15 posts in which the poster struggles without recognition for some time before attracting the eyes of the moderator and beginning to have higher moderated postings. Having received the +1 karma bonus, probationary period ends, and while there may continue to be pressure to have a highly scored message (far more people are likely to see a message at +5 than they are to see a message with a score of +2), the overall drive for karma is reduced.

By looking at both the formal aspects of these posts and their content, we can tease out some of the elements that make up a +5 posting. Despite what one might expect, there are no particular formal similarities among highly ranked posts. The length of the post does not affect its likelihood of being rated highly. Misspellings

have no appreciable effect—actually, there is a slight correlation of misspellings to *higher* scores, but only at r=0.1. One would expect a fairly high correlation between

*Table 3-2. First 15 posts and variations. (See text; * p<0.05.)*

Name	First Mod. Post	Posts Considered	*r*
Andrew	2,xxx	15	.36
Bruce	6,xxx	28	.32
Charles	18,xxx	15	.37
David	27,xxx	15	.66*
Edgar	28,xxx	15	.28
Francis	69,xxx	15	.34
Gerald	100,xxx	15	.28
Harry	111,xxx	15	.32
Ian	114,xxx	15	.50
Jessica	136,xxx	15	.22
Kelly	142,xxx	7	.20
Larry	151,xxx	46	.25
Mike	177,xxx	15	.17
Nate	203,xxx	15	.37

early posting and high moderation, since moderators are more likely to expend their points in moderating the first posts they see, and those posts will have a longer window in which moderators might exert influence over them. In fact, although there is clearly a reduction of high scores in the last 10% of each topic[15], the rest of the

[15] Which usually represents comments posted well after the topic is "stale." Someone decided to experiment with this: "Subject: Hacking /. Not the webserver, but the people and their behaviors. I'm posting this early Tuesday but the article is from Saturday. I'm guessing nobody will read this, much less moderate it. Why would anyone read a stale thread like this one when you can rant about the Caldera Settlement or those wacky Uruguyans instead? Maybe you just want to listen to the mad raving of a demented individual such as myself. If you are a moderator and have read this much of my post already, why not moderate me? Up or down, it doesn't matter. Just acknowledge me, damn it! Omigod, I left my telephone in the oven. Gotta go." It did not appear to have been moderated.

postings are barely affected by their distance from the top. This lays to rest some of the most frequently repeated rules of thumb for those seeking high scores.

Another strategy that is sometimes repeated is that dogmatic allegiance to the Linux operating system over all others will receive the highest scores. Although it is difficult to find fans of Microsoft operating systems on Slashdot, it is not unusual to find those who prefer other forms of Unix-family operating systems—Solaris, *BSD, Irix, and others—or non-Unix operating systems like BeOS, MacOS, and others. Despite the widely held belief that a mention of Linux guarantees upward moderation, looking at posts with scores of +5 from November of 2000 through January of 2001, none mention Linux except in topics where it is of import. That is, unless the topic itself is directly related to Linux, there is no mention of the operating system in the highest-ranked posts. Of course, it may be that such dogmatic misapplication of Linux pervades the lower-ranked postings, but if so, they are not being elevated via peer-moderation.

There are other claims about the nature of Slashdot dogma. In particular, it is often identified in the mainstream press as being anti-Microsoft. The most often raised example of this is the logo used for Microsoft, a picture of Bill Gates as the "Borg" character from *Star Trek* (see figure 3-2). While there is certainly the implication that "Microsoft will assimilate you," the image itself is not enough to condemn Slashdot as a bastion of anti-Microsoft sentiment. Rob Malda (CmdrTaco) has identified himself,

at one point, as a Borg (*http:// slashdot.org/ features/ 98/11/16/ 1446250.shtml*), and the machine-like nature of the depiction is not as negative as it might be in other communities. While there are certainly outspoken critics of Microsoft both among the Slashdot community and the editors, this is often counter-balanced by a call for fair and deliberate analysis. Richard Stallman has also been referred to as a "borg" on Slashdot for advocating a hard line against commercialism. While "Bill the Borg" is the most visible indication of a bias, it is important to examine the discussion among the users and the moderation to understand the degree to which this affects open dialog over issues on the board.

Figure 3-2 – Icon used for Microsoft stories.

Many Slashdot readers make use of Windows machines, and in one poll (with the earlier caveats about informal polls still in mind) places the number of people who regularly read Slashdot with the Internet Explorer at 40%. A number of Microsoft employees regularly contribute to Slashdot, and defenders of Windows can easily be found (though there are few fans of Microsoft's business practices; but this is a position shared by the vast majority of the computing industry). An article in January of 2001 that provided information on a security flaw in Internet Explorer saw both criticisms of Microsoft and proprietary software generally, and applause for editors

undertaking a less partisan stance. The moderation model did not exclude those who were less dogmatic. Of all the posts that garnered a score of +4 and +5, the tone was mixed: several provided reasons that they saw the flaw as important and dangerous, a smaller number lauded Slashdot editors for posting information of value to the Microsoft user base, but none actively promoted the Explorer as a superior product. A search for the term "Windoze" (a diminutive for Microsoft's operating system) returned nearly 1200 Slashdot articles in which the word is used; searching for "Micro$oft" returns just over 600 articles. However, these terms generally appear in the discussions rather than in the article topics, and represent the majority anit-Microsoft sentiment among Slashdotters. From the very beginning the editors showed less-than-sophisticated antipathy toward Microsoft and Gates[16], but by the time the number of Slashdot users had climbed into the hundreds, the attitude had changed. Some even were suspicious that hard line, unsophisticated attacks on Microsoft were plants from Redmond, while others realized that they were just embarrassing hangers-on (see *http:// www.slashdot.org /articles/ 98/09/05/ 1610223.shtml*, *http:// slashdot.org/ features/ 98/09/17/ 1040221.shtml*).

Slashdot remains a gathering point for those who are involved in open source, and for many of them Microsoft and Bill Gates represent a flawed and dangerous

[16] One of the oldest Slashdot topics (*http:// slashdot.org/ articles/ older/ 00000004.shtml*) appears to be a test page for the system and includes postings like "Bill Gates Eats Cow Feces." Other postings during the early years are equally as inflammatory. By the later years, and with an increase in the number of editors, this tendency toward puerile Microsoft-bashing abated somewhat.

model. The question is not so much whether there is a great deal of criticism of Microsoft on Slashdot—there most definitely is—but whether this hampers the role of Slashdot as a working model of Habermas's public sphere. Andrew Baoill (2000) argues that the bias, along with the moderation system, leads to a reduction of the potential of Slashdot for free debate. On the other hand, the discussion itself demonstrates that rational debate is taking place, despite the view held commonly both within the community and from the outside that Slashdot is home to monomaniacal Linux advocates[17]. The aims of diversity and consensus are, even in an idealized system, in natural tension. In real world systems, there will always be a majority. The question is whether the existence of a majority ends the possibility of discussion. On the contrary, Slashdotters encourage ideas that they do not share, because they see the added value of such views to a discussion. We can conclude that members of the Slashdot community are, by-and-large, Linux and Open Source advocates and that at the same time the community (or communities[18]) represents a place in which open expression is strongly encouraged[19].

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[17] Baoill's concern with the purchase of Slashdot by Andover.net is more valid. It will be difficult for Slashdot's editorial team to maintain their claimed objectivity when they are owned by a for-profit company with interests in open source. Even more difficult will be *appearing* neutral.

[18] As one poster notes: "I'd go so far as to call /.'ers a group of communities. The clever trolls, the simple goatse.cxers and spammers, the Linux zealots, the corporate sysadmins sitting bored in their office /.'ing all day, etc. A series of communities, with their own forums for discussion, clashing or joining every so often in an article or secret SID that spans a few of their interests at once."

[19] This is the age-old argument about whether advocates of free speech should allow those who wish to eliminate free speech to be heard. The answer is, of course, yes. Given that the political leanings and biases of the board are toward communal production, open discussion, and peer-criticism, it remains a viable environment for public debate.

If we dismiss the commonly accepted views of what it takes to receive high scores, what are we left with? While there are a number of possibilities, two stand out. Responses that clearly refute an earlier position, and provide evidence backing their position, are often moderated up. Humorous posts are also often moderated up. The ideal post cleverly refutes or supports a position in an amusing and thorough way.

Never Having to Say You Are Sorry

It is a bit of a conundrum: How can an effective discussion system be designed when (a) some hackers have a reputation for being difficult to get along with, and (b) even those who are more peaceable under other circumstances revert to flames in on-line discussions. Discussions on Slashdot are sometimes reduced to personal attacks of the worst kind. What is more impressive is that this is an exception and not the norm. By and large, discussion remains relatively civil, and attacks, while often personal, are rarely elevated by the moderators unless they present unique and well thought-out viewpoints. While many researchers are working on formal solutions to problems of argumentation—including software that sometimes falls under the rubric of Computer Supported Collaborative Argumentation[20]—Slashdot shows that while argumentation may not be understood at an individual level, in the aggregate moderators tend to do a reasonably good job in extracting the most important elements of an argument.

[20] See *http://kmi.open.ac.uk/people/sbs/csca/* for links to such systems.

What is the nature of discourse on Slashdot? The discourse that takes place on the web site is neither entirely driven by the architecture of the site, nor easily separated from it. Discussions on Slashdot take on an unusual form. Like many other types of on-line discussion, they do not fit neatly into existing genres; sitting at the cusp of oral conversation and written exchange, inheriting characteristics from both. More than this, as was noted in the previous chapter, dialog of the sort that takes place on Slashdot has been called "very large-scale conversation" (Sack & Dumit, 1999) and "mass interaction" (Whittaker et al, 1998). It differs in several ways from other forms of interaction. First, there is significantly more discussion than can be digested by any one person. On-line mailing lists and individual bulletin boards tend to work with the assumption that the individual will read, or at least skim and filter through, each posting. The process of threading, both in email discussions and bulletin boards, was an intermediary step on the way to the collective moderating found on Slashdot and similar systems. These moderation systems allow for an "emergent" argument, one that forms not between two interlocutors but through an iterative and interactive process of posting and organizing[21].

Participants in on-line discussions have often had moderation of some sort. In many cases this was an appeal to an appointed individual who would then be asked to

[21] Others have taken up the issue of an imbalance between posters and "lurkers" in on-line discussion systems, as well as how these systems scale (Jones & Rafaeli, 1999). It is interesting to note that although no empirical indicators are available to measure the impact of lurkers on the moderation process, Slashdot has managed to, at least in some degree, counter this by allowing readers to moderate even when they do not post.

censor the discussion. In “unmoderated” discussions, when flame wars erupted they could destroy the board. What begins as an exchange between two extreme positions leads to an explosion of posts between the two, and eventually others write in the hope of stopping the feud only to be sucked in. Like a barroom brawl, lurkers who see the traffic increase ten-fold—and see the traffic is of little value—decide to stop reading or participating in the group. Slashdot, as it grew from a site of a few dozen to a site of a few hundred thousand, evolved an architecture that made filtering and sorting easier, by relying on a relatively anonymous, collective system of moderation.

It was a solution that grew with the site. Malda noted the rise of “noise” on the site, and that meaningless “first post” postings (these still appear, though are quickly moderated down to –1), were making the site unusable. In September of 1998, he posted a series of possible solutions, among them: not allowing anonymous posts, being able to hide anonymous posts, filtering out comments that said “first,” or doing nothing. One possibility was some sort of voting system:

> This is probably the trickiest to implement cleanly. What [I] imagine this would work like would each comment would have some sort of score. Comments could be given points or have points removed based on how many people vote somehow.
>
> The problems with this system are many: first off, its a hassle to moderate, and most people wouldn't really want to do it. Second, it would be open to abuse. I don't want 'unpopular' comments to go away, just **stupid** ones. I'm all for disenting [sic] opinions: I don't want someone who disagrees intelligently to be deleted just because another thousand people think what they say is wrong. And let's face it, if anything pro microsoft [sic] was posted (even if it was true!) it would be voted out of the system in about 7 seconds. (*http:// slashdot.org/ books/ 98/09/17/ 1750222_F.shtml*)

The system went through a series of changes, with participants providing comments at several steps (e.g., *http://www.slashdot.org/articles/98/10/30/2334243.shtml*), until it evolved to its current state, which encourages lurkers to moderate, to contribute to the debate topologically if not textually. While some enforcement of the informal rules (netiquette, etc.) certainly occurred on earlier systems like Usenet, the worst others could do was usually to write a chiding retort—the "more speech" solution (Smith, McLaughlin, & Osborne, 1998; Reid, 1998[22]). With Slashdot, posters who do not conform to the norms are "put in their place."

Slashdot has something in common with a MOO in this respect. Participants can change the flow of conversation not only by adding to the conversation with more words, but by silently, but effectively, changing the conversational environment so that certain views are highlighted. It is the computer equivalent of "hear, hear," or of a nodding audience. Were tens of thousands of people to post "I agree" the board would be impossible to read, but by electing at random representatives of the audience, the cultural values of the community are expressed in real terms by elevating those threads thought to be most valid. Though some have associated the voting system on Slashdot with censorship, it is really a grounding mechanism that allows for collaboration. David Brown suggests that this is vital to creating collaboration among strangers:

[22] In fairness, Reid does admit the role of virtual violence in MUDs, which correlates in some ways to the scoring of messages. Though not an exact match, Slashdot could certainly be played as a game, just as Adventure MUDs can be taken quite seriously.

> Feedback facilitates strategic behavior—that is, behavior that arises not just from personal preferences, but is conditioned by what others are doing. Without feedback it is presumed that you and I go our separate ways because it is impossible to know enough about so many others' preferences and behavior. (1995, pp.106-7).

Slashdot presents an interesting example of a topology that responds significantly to the demands of the users. Since topology can have an important effect on the way meaning is transmitted (Davis & Brewer, 1997, pp.55-60, 68-75), the way in which Slashdot promotes a self-organizing topology suggests an innovative path to scalable virtual publics of the future.

A brief illustration of an argument that has been moderated may be of interest. An American author wrote to ask where she might move if corporate and government control continued to threaten individual freedom in the United States. In the 5 hours following the posting, over a thousand comments were posted. Over the next few days, this grew to nearly two thousand. This is a small segment of that discussion:

Are you serious? (Score:5, Interesting)
by Teethgrinder **(sd@oos.org)** on Wednesday January 03, @12:49PM EST (#15)
(User #2842 Info) http://www.oos.org/

This is not meant inflammatory but I'm really irritated by this statement: *Is the United States still the best choice of a place to live for safety, freedom, and quality of life?*

Do you really mean that? What led you to believe that this ever was the case? I really have trouble grasping this US sense of patriotism.

Seriously, I'm just curious...

Re:Are you serious? (Score:4, Interesting)
by Blue Neon Head on Wednesday January 03, @12:58PM EST (#85)
(User #45388 Info)

This is not meant inflammatory but I'm really irritated by this statement: Is

the United States still the best choice of a place to live for safety, freedom, and quality of life?

Do you really mean that? What led you to believe that this ever was the case?

What led you to believe that it wasn't? In which nation would you prefer to have spent time in before WWII? Americans enjoyed a higher standard of living, higher per capita income, and more freedom than most Europeans did, with the added bonus that we weren't ravaged by war every decade or so. However bizarre this "US sense of patriotism" may be, and however much stupidity may manifest itself here, it's hardly jinogistic to say that, in general, Americans have had it better than most.

Re:Are you serious? (Score:5, Insightful)
by Tackhead on Wednesday January 03, @01:05PM EST (#121)
(User #54550 Info)

> *Is the United States still the best choice of a place to live for safety, freedom, and quality of life?*

Safety, freedom, quality of life. Choose any two.

No -- can't have both safety and freedom. (Score:3, Insightful)
by cduffy **(cduffy at bigfoot dot com)** on Wednesday January 03, @01:48PM EST (#442)
(User #652 Info)

You can't have safety and freedom, even at the cost of QoL. The measures used to guarantee safety are, when overextended, what kill freedom. The relationship of these two to quality of life is something I'm not going to speculate on.

Re:Are you serious? (Score:5, Interesting)
by matman on Wednesday January 03, @01:05PM EST (#122)
(User #71405 Info)

Canada's not too bad - although I can't really compare it to other countries...

Here, even child pornography has been found to be protected under free speech laws. That's kind of nutty, but it shows that we're serious about free speech, even if we have to take the bad with the good.

The only major invasions that we've had (that I'm aware of), were the Americans trying to take the country; apparently Canada is their 'manifest destiny' or something like that.

All 32 posts from this segment can be found in Appendix A; the above excerpt shows what this segment would look like with filtering set at three and above. This segment provides good examples of the elements of a post that lead to its upwards moderation.

The characteristics described extend to most discussions on the board—this short segment provides examples of several of these characteristics.

The primary observable difference between the messages presented here and those that were not moderated up to this level is that these cut directly to the propositions at issue, and respond directly to the salient points raised by the article or an earlier poster. Some of these decisions are obvious from the perspective of an outside observer. As can be seen in the appendix, for example, an extended thread on the Canadian climate was judged as being superfluous, and never elevated. Likewise, the initial comment included a question about "this US sense of patriotism." The language choice here ensures its inflammatory nature, despite the earlier disclaimer. While the specific questions asked are responded to, the issue of patriotism is left untouched—at least in those messages that were preserved (i.e., those with scores of zero and above).

Unsubstantiated assertions (e.g., "live in Canada, and get all three") are left at the margin until the thread is picked up and elaborated later on, with an (extreme) example of freedom of speech in Canada. Once again, it is the argument that rises to the top. As seen in the appendix, the original author and a second poster provide further elaboration and sources for the assertion that child pornography is legal in Canada. Support for the posting on the difficulty of maintaining freedom and safety—a quotation from Benjamin Franklin, and another from Albert Camus—remained at a

score of +1; again, while accessible to someone interested in the discussion and willing to see the expanded version, for those looking for the central arguments, they are extraneous.

There are other arguments—like the idea that safety provided by the *state* is not possible within a free society, but personal defense (guns, martial arts training) is an alternative—that constitute a critique, but are clearly not compelling to the moderators. This is a good example of the fact that the function they serve is not purely procedural. Despite admonitions by the FAQ that moderators should not allow personal opinions to guide their judgments (and the prohibition from posting in a topic one is moderating), clearly moderators are subjective in their determination of salience. This sometimes manifests itself not in polarization to a particular viewpoint, but in the extraction of dialectical relationships where a multiplicity of arguments might be present. While this may affect the view for a disinterested reader who wants an overview of the ideas, someone who is more interested can always lower their filters selectively to read some of the alternative ideas that have been expressed.

Those articles that directly quote and respond to an earlier poster are more likely to receive a high score. This is at the same time a topological action (informal "threading" of the conversation) and a textual contribution. The desired effect is a continuation of the conversation, either elaborating or refuting an earlier comment.

Davis and Brewster (1997) liken this process to the building of a coral reef, in which topics of interest gather increasing posts while others are left to languish.

This conversation continues over several hundred more posts, many of them comparing life in Canada and the US. It is important to note that most of the posts at lower levels also reflect many of the values found in the top posts. That is, a focus on the central elements of the argument, clearly addressing earlier comments, and limitations on personal attacks all are necessary to be raised to the higher scores, but they are rarely sufficient. In order to be elevated to a +5, the post should be clear, concise, convincing, and clever. Both these necessary and sufficient conditions permeate the discourse on Slashdot. Argumentation is revered, as is civility. Later in the discussion on Canada, one poster begins her post with: "I seemed to have hit a nerve there. I will accept your insults (i.e. mental instability, hypocrisy) with a smile/maniacal grin since I was guilty of doing the same to the original Poster. However, I must respond to your other comments…" She then goes on to treat the substantive issues in the post. Later in the same topic another poster begins with "Anyway, I'm going to ignore all the attacks (mine and yours) and explain my point again…" Despite, the claims of attacks, most of these do not extend beyond calling someone a "moron," then presenting evidence of why their opinion is more valid.

A lack of such civility, along with clearly off-topic posts, will likely result in a moderation to –1, the equivalent of deletion. Posts that say no more than "First Post!

Whoohoo!" remain common, and are quickly moderated down. Attacks on earlier posters' grammar, spelling, sense of humor, or intelligence (e.g., "u = stupid") are usually moderated down into oblivion. Gratuitous vulgarity and insults are also quickly moderated down. Insults that are clearly intended to create flame wars (i.e., "flamebait") are eliminated. There is a subculture that posts only messages intended to be moderated down. These postings rarely have anything to do with the topic at hand, and often revolve around racist, misogynistic, or homophobic exchanges. Slashdot at –1 reads like a very different board, indeed. One could suggest that a certain degree of diversity is lost when these messages disappear, but the filtering system that Slashdot employs makes it a useful source of information and insight. For a public sphere to remain workable, there must be an accepted set of ground rules[23].

Does this style of argumentation provide a public sphere and does it lead to a consensus? First, most recognize Slashdot as a place where issues can be discussed and criticized. Those elements that rise to the top are, most often, thought-out and documented criticisms of the news that has been presented. It is very difficult to know whether those who post have hidden agendas, but the number of posters who go to great pains to make clear their biases[24] makes this seem unlikely. An examination of

[23] An interesting codification of this is provided by Lars Wirzenius's "Advocating Linux" (2001), which provides a set of recommendations for those who wish to advocate Linux in various on-line settings without alienating the movement.

[24] A search for the word "disclaimer" or "disclosure" yields a number of examples of those who are advocating a product or course of action being explicit about their personal interest. E.g., "Certain MBA programs, e.g. MIT's (disclaimer: I'm currently at MIT's Sloan School of Management), can expose you

posts moderated to +4 or +5 provides a sketch of the major critiques of the item presented in the topic, without a great deal of extraneous information. Those interested in alternative arguments and further discussion can easily "drill down" to lower levels of moderation to gather more information.

In sum, the social and technological dynamics of Slashdot produce views that represent more than simply a majority. While there are dissenters who criticize the decisions of the anonymous moderators ("the moderators are on crack," is an oft-heard refrain), and there are those who lament the lack of agonistic flame wars, for the most part the system allows individuals to engage in argumentative discussion, while providing clear areas of agreement and information.

Score: 5, Funny

Humor makes up an important part of the discourse on Slashdot. It is used strategically to advance an argument, to lampoon those in power, to (often through sarcasm) imply the elevation of all things technical, and to build an identity that separates the Slashdot community from others. This humor can be used with excellent rhetorical efficacy, but it is also the most frequent source of unintended offences, miscommunication, and exclusion on the site.

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to as much of the business environment around entrepreneurship as you want so that you can develop the skills to deal with VCs…" (*http://slashdot.org/askslashdot/01/06/11/1619235.shtml*).

The use of sarcasm is, in part, an exclusionary practice, a demonstration that there is a shared understanding that allows a message to be decoded as an amusing *reductio ad absurdum*. Parody is a well-known mechanism of resisting authority, but according to Hugh Duncan (1962, p.376), "comedy *upholds* as well as resists authority by making ridiculous, absurd, or laughable whatever threatens social order." According to the "Jargon File" (Raymond, 2001), "dry humor, irony, puns, and a mildly flippant attitude are highly valued" among the hacker community. Humor on Slashdot frequently requires some form of specialist knowledge, not just of programming or of Linux, but an understanding of the history of Slashdot, running jokes, "1337 speak"[25], science fiction literature and film, and (to a lesser degree) anime. It is perfectly possible to be a working programmer without this sort of cultural literacy, but this would exclude one from much of the humor that appears on Slashdot.This process of ranking and exlusion has been noted by other authors in various online discussions, and particularly in the case of trolling[26].

[25] A sub-cultural dialect used by the warez community (those who pirate software) and, to some extent, the gaming community. "1337 hax0rz" is used (presumably due to visual similarity) for "élite hackers." Raymond points to the website of Jeff K. (*http://somethingawful.com/jeffk/*) , a parody of the culture, for examples. Use of 1337-speak on Slashdot generally connotes a sarcastic message, intimating that the claim is worthy only of an immature and untalented "wannabe."

[26] "Trolling" refers to publishing things that are obviously wrong (often humorously) in order to incite a correction from someone "taken in" by your troll. Tepper (1997) provides the example of someone posting to a Star Trek discussion that clearly the directors had made an error, since there are no shadows in a vacuum. This caused a rush of corrective emails. Tepper's analysis is joined by that of Donnath (1998) and Jordan (1999)—they all argue that humorous trolling is a mechanism of exclusion and successfully evading a troll is sometimes a rite of passage for new members of the community.

Some of that humor derives explicitly from forms of coding. For example, non-verbal cues are sometimes expicitly expressed using the tags like those found in markup languages:

- (sarcasm)Or most of western Europe. And we know how terrible and miserable life is in France, Germany or Sweden...(/sarcasm)
- [sarcasm]I guess that's all Debian and Suse do for that matter too[/sarcasm]
- …every day numbers are expressed in base 10, which makes handling a base-10 measurement system so much easier. Base 10 is drilled into everyone's mind since their kindergarten. SARCASM and yes base 60 is so much easier, no wonder it's so easy to teach children how to read a clock ! /SARCASM

Or simply through parenthetical notes:

> Thank you for that oh-so-enlightened *ad hominem* attack and "econ in a nutshell," Dr. Friedman. It dovetails so well with the rest of your completely specious argument. I don't feel the need to wear my education on my sleeve. With regard to your point about free services being unable to exist without revenue, gosh--I can't imagine that there could have been any internet at all before all that commericalization [sic] arrived. (That was sarcasm, in case it wasn't readily apparent.)

These are cases in which the author felt that the sarcasm was not obvious, or where it could be taken as flamebait otherwise. (Certainly, insults to life in Western Europe or implying that Debian is only interested in profit would result in flames from other Slashdot posters, if they were taken seriously.) In other cases, intended sarcasm is lost in the low-context format of the web log.

- *...utilities like sed, grep, awk, lex, and yacc, whose functions should be obvious from their names.*
  It took me a minute to realize this was sarcasm!

- That was sarcasm. You could tell by our user id that we "joined" slashdot at about the same, assuming each of these accounts are our first. Although given what time we're each posting, I'll just assume we're tired.

Or, consider the following exchange:

Re:Arslay, allcay ouryay officeay! (Score:1)
by SCHecklerX on Tuesday March 06, @11:00AM EST (#201)
(User #229973 Info)

> As silly as it is, I think the logic is valid. I personally prefer double or even quadruple ROT13 for maximum safety, but this is an interesting application of the "logic" used to create the DMCA.

Um...Need I point out the obvious?

Re:Arslay, allcay ouryay officeay! (Score:2)
by MadAhab **(736c617368657240616861622e636f6d)** on Tuesday March 06, @03:06PM EST (#413)
(User #40080 Info) http://www.ahab.com

No, we all understand perfectly that research has demonstrated quadruple ROT13 is no more effective than double ROT13, which is why double ROT13 is in such widespread use.

Boss of nothin. Big deal.
Son, go get daddy's hard plastic eyes.

Re:Arslay, allcay ouryay officeay! (Score:1)
by CodeMonky **(paland@stetson dot e dee you)** on Tuesday March 06, @10:19AM EST (#106)
(User #10675 Info) http://www.monkylabs.com/codemonky

I have a feeling it was sarcasm.

--"Karma is justice without the satisfaction"

Re:Arslay, allcay ouryay officeay! (Score:1, Offtopic)
by Squid on Tuesday March 06, @10:20AM EST (#108)
(User #3420 Info) http://flyingmice.com/squid/

Please locate the gain knob for your Humor Detection circuit and turn it solidly to the notch marked 10.

~ radiographite: art by john shepard

The joke relies on the reader recognizing that ROT-13 is a very simple cipher that was used for many years on Usenet as a way (at least in part) of excluding “newbies” (new users). It consists of rotating all of the letters in either direction by 13 steps. Clearly,

doubling or quadrupling ROT-13 would result in the original plaintext remaining unchanged. This is a joke that shows up repeatedly on Slashdot.

When snippets of code or shell scripts appear, they are almost always intended to be humorous and the != (not equal) symbol is sometimes used in text. Other elements, like the addition of "-fu" to the end of terms to indicate a skill or art, the ubiquitous "All your base are belong to us" (taken from a badly translated Japanese video game), adulation of Natalie Portman, and references to "the red pill," are not specifically computer-related, yet can find a wide audience among those on Slashdot. The result is that a neophyte may find a discussion on Slashdot to be incomprehensible, even if she is a skilled computer programmer.

Ironically, it is the pervasiveness of a sense of humor that enforces a common base of discourse among participants ("Irony is a kind of complicity among equals," Duncan, 1962, p. 385), while at the same time excluding those unfamiliar with the site[27]. For any sort of communication to occur, there must be some assumed common ground. In other contexts, we have direct knowledge of individual common ground. In the case of a public space like Slashdot, we have to assume a certain degree of knowledge. That assumption can draw on common "nerd" or hacker knowledge now

[27] It should be noted that this is a kind of active exclusion, what Goffman (1963) would call "engagement disloyalty," in which the "troll" enters into discourse with an unsuspecting neophyte in the effort to amuse those "in the know." Goffman provides examples of psychiatric attendants who tease their charges for the entertainment of the staff or public, and others who unwittingly embarrass visitors. With few cues with which to judge the effects of these disloyalties, the practice is far more likely to happen on-line. While those engagements meant to draw in an unsuspecting interlocutor (trolls) are often reduced in score, "in jokes" (which often receive the highest scores) implicitly exclude those who might want to participate.

reaching back several decades. In addition to this identity-based common ground, those who post to Slashdot generally assume that others have been engaged in the "Slashdot project" for some amount of time and that comments can (as in the case of double-ROT-13) be built upon. This assumption, called the "linguistic copresence heuristic" among speech analysts (Clark & Marshall, 1981), allows for conversations to continue over time. It remains, for example, a challenge for most programs that simulate conversation (chatterbots), but often lose track of the context of the discussion. Likewise, discussions on Slashdot often cover ground that has already been covered, to the consternation of many, because new participants do not share the assumed common ground. Thus, some of the humor can be attributed to the sometimes incorrect assumption that the poster shares a culture in common with the readers. However, such posts can also be used to either consciously or unconsciously exclude those who want to become part of the Slashdot community.

Pexman, Ferretti, and Katz (2000) note that irony is used as an exclusionary device, and that the recognition of irony on-line is often driven by some assumed familiarity with the speaker's group[28]. We have approached Slashdot as a virtual public rather than a community, but even though there is a very large group of contributors, it is in sarcasm and humor that Slashdot shows itself as a community of sorts. The application of humor is rarely intended *only* to amuse. Often, sarcasm and

[28] They note, for example, that blue collar workers are the most likely to use sarcasm and irony, while scientists, etc., are less likely to do so. Therefore, knowing ahead of time that a cab driver (their example) is speaking will prepare a reader to expect irony.

parody are used in a way to further an argument. The majority of the humor remains "nerdy," and requires knowledge of the culture and practices of the community to understand. While Slashdot operates on principles of openness, in practice the content tends to be exclusionary. Clearly this is exclusionary in only the mildest terms, given the wide audience Slashdot attracts, but these messages are also an indication that the model audience of a Slashdot writer is the nerd, and not the general public[29].

Framing Slashdot

Studies of newspapers have attempted to discover the "frames" used in the encoding and decoding of articles. Drawing on the ideas of Erving Goffman (1974), a number of communications scholars (Pan & Kosicki, 1993; Entman, 1993; Tuchman, 1978; Gameson, 1992) have argued that analysis of key newspaper frames can help to enlighten the role they play in filtering and transmitting information. Frames are based in cognitive constructs shared between writer and reader and "enable journalists to process large amounts of information quickly [and to] package the information for efficient relay to their audiences" (Gitlin, 1980, p.7). Pan and Kosicki argue that these constructs frequently plug into overarching myths or themes, rhetorical patterns, and

[29] A recent Slashdot post reflected the exclusionary nature of humor in a post about Monty Python: "The only thing about Monty Python and popular culture (read, Star Wars, Matrix, etc...) that is different, is that the Pythons were very talented and an extremely well educated bunch. Their sort of humor appeals more to the intellectual type (geeks) than average sit-com crap. A large proportion of their comedy is intellectual. If you get the jokes, you are suddenly part of a club. How many people would find the 'Bruces Philosphers Song' (sp) outrageously funny? Not everyone I would wager. The reason I would say this is that Joe Average probably has no idea who Immanual Kant, Heidgger, David Hume et al were!"

writing styles or structures, and that the five framing devices outlined by Gameson—metaphors, exemplars, catch phrases, depictions, and visual images—are used to help reproduce these structures. Entman suggests that the main function of framing is to constrain the salience of different elements in a particular news event, that is to emphasize certain perspectives or facets of a problem while de-emphasizing or ignoring others.

While postings to Slashdot are not the same as newspaper articles—they are not, for example, created within the same organizational context—the idea of news frames applies as directly if not more so. The validity of the framing approach relies on a uniform author and reader. When audiences are more diverse, the opportunity for polysemic readings of the text is present (Fiske, 1986). The confusion that occurs—the example above provides some indication—when a joke is not understood, is at the same time an exclusionary practice and a chance to reinterpret a work. In the case of Slashdot, this happens only rarely. Those who participate as conversants, as opposed to lurkers or moderators, tend to be well acquainted with the cultural frame informing the discussions on the board. As we've seen already, there are certain characteristics of the successful Slashdot post. All of these may affect the content of discourse, but other pervasive elements also influence the construction and understanding of posts.

Like any social movement, the Open Source movement has developed a set of myths. These myths extend stories that already existed within the hacker culture, and

are used as a guide or template for understanding the news. This cannot be more explicit than in the casting of Microsoft as the "Evil Empire." Consider the following exchange, which was in response to a judgment in the "Nuremberg Files" case:

my anti-m$ website can go back up (Score:3, Funny)
by mr_gerbik on Wednesday March 28, @04:32PM EST (#13)
(User #122036 Info)

Now I can resume my website that publishes the names and addresses of microsoft employees in hopes that it shall bring them to an early demise. MUAAAAHAHAHAHAHAHAHAHA!

-gerbik

Re:my anti-m$ website can go back up (Score:2)
by wesmills on Wednesday March 28, @05:14PM EST (#206)
(User #18791 Info) http://www.wyvern.org

Thanks. We all really appreciate that. Especially the customer service and support people that have nothing to do with crafting company policy or writing software.

This is my mirror.

Re:my anti-m$ website can go back up (Score:3, Funny)
by mr_gerbik on Wednesday March 28, @05:31PM EST (#256)
(User #122036 Info)

I'm glad you appreciate a GOOD JOKE. Lighten up my friend.

I would work for Microsoft if I could.. but they said my coding was too solid for their taste.

-gerbik

Re:my anti-m$ website can go back up (Score:1)
by Pinball Wizard **(josheverist@yahoo.com)** on Wednesday March 28, @06:47PM EST (#427)
(User #161942 Info) http://www.page1book.com/images/dilbertbase.jpg

OK, call me thick, but the company that produces the book Writing Solid Code denied you a job...because your coding was too solid?! I was under the impression they were always looking for talented developers.

Or was that another joke?

Miranda's murder was never solved because the suspect invoked his right to remain silent. Now *that's* ironic.

Re:my anti-m$ website can go back up (Score:2)
by nyet on Thursday March 29, @07:48AM EST (#628)
(User #19118 Info) http://this.wildcard.domain.really.fuckingsucks.net

No, no, no, no.

THEY'RE more like the independant [sic] contractors that were working on the (incomplete) Death Star when those pesky rebels blew the fucker up.. hell, they KNEW they were working for the Evil Empire (tm), and thus knew that they in for. You can't do that kind of work without building up some serious negative karma, man.

Re:my anti-m$ website can go back up (Score:1)
by electricdream on Thursday March 29, @10:31AM EST (#662)
(User #413007 Info)

If you do the work of the devil you are as guilty as the devil. Lets face it you are involved in making M$ policy, you allow the company to exist. By working for Microsoft you are supporting thier [sic] ends. It's kinda like working for world peace. which I suppose M$ is doing in it's own way... excuse me, in the same way as Hitler. God can they do anything without ripping it off?

Note that these final posts were not moderated up, but equating Microsoft with evil, the devil, and Hitler represents the frame in which much of the news is interpreted. This does not mean that there are not pro-Microsoft posters (employees and apologists), but that they rarely counter the automatic template that is placed on any discussion of Microsoft[30]. The term "the evil empire" can be used without explanation.

Some recurring themes were introduced above, but there are others. For example, comments about "Beowulf," a technology that allows clusters of PCs running Linux to act as a parallel supercomputer, arise in a wide range of posts (on topics ranging from Furbies to Toasters). One poster writes:

[30] Note that there are two ways to read the post by "nyet." Clearly, both are as a joke, of sorts. One could read it either as willful exaggeration, or as an ironic reference to Timothy McVeigh's explanation that his bombing was like the destruction of the Death Star, which hosted clerical workers as well as Storm Troopers. If the latter is the case, it was clearly not picked up by "electricdream" in the following post.

> Can someone moderate down this Beowulf crap ? I mean, must we read it in every slashdot story ?

Other posts explicitly note what "every Slashdotter knows." For example:

- You'll still have to bag your clothes, food, etc. It's not going to much faster, if it all. God, if I had a nickel for every Slashdot reader with a mindless hard-on for useless technology.

- As every Slashdot-reading tech-head knows, non-programmers just don't appreciate how much one needs to know to write good code. But it's easy for US to underestimate what's required to successfully battle the efforts of the corporate powers to lock-in their profitable third-rate technology. The main weapons of our non-scientific allies are LANGUAGE and STRATEGY. They may appear simple, but in fact expertise is important:

- The thing I liked best about Sneakers was not that it got the tech right. You can't get the tech right in a movie, it seems. But they got the people right. I mean, every Slashdot whacko can identify with Dan Akroyd's character.

- MS would do this secretly because they've accepted the role as anti-open source (which I think was forced on them, btw). If they 'embraced' open source in publicly by doing the porting publicly, wouldn't every slashdot zealot automaticly [sic] claim this proves open source (and likely I'd guess they'd mean GPL open source) is superior?

This feeling that there is a set of knowledge and beliefs held among Slashdot posters and readers allows for cognitive shortcuts and ways of effectively handling large amounts of information[31]. This includes both those pieces of knowledge that are assumed to be obvious (e.g., that open source development is at least a valid way of building software, and likely superior for many or most kinds of software), as well as excluding views that are inconsistent with the worldview of readers and therefore *too*

[31] "The Slashdot Purity Test" provides an amusing list of knowledge and experience that a Slashdotter is expected to have, focusing not on cultural or technical knowledge so much as experience with Slashdot itself: *http://www.pompano.net/~stiletto/slashdot.html*.

controversial to be moderated up (e.g., the idea that computerization in some ways dehumanizes life)[32].

This feeling of shared knowledge and culture leads to a hidden coloring of the news. The readings of posted articles are often resistant—that is, they rarely take news from traditional sources at face value. Here, a Slashdotter doubly-damns a story from *Fox News*:

> Okay, why is everyone up in arms about this? First, this story originated from - say it with me - the popular media. Of course they're gonna mess it up, thats what they've been doing the entire time. Second, this is **FOX News** we're talking about here. The same network that brought you "Who Wants to Marry a Multimillionaire" and soon, "Temptation Island."

On the other hand, the collective filtering of stories tends to highlight and make salient particular aspects of a story. This is not the sort of individual filtering that is implied by the "Daily Me." Nor is it the sort of mass framing that occurs in the mass media. It is, however, a framing of the news. Any social movement depends on the contrary goals of coalescing support for a position while countering the dominant ideology. The irony—that movements can become as single-minded and bureaucratic as the systems they are rebelling against—is one that is familiar throughout history. There are indications that on-line communities attract those who are accepting of diverse viewpoints (Young, 2001), but like many on-line venues, Slashdot maintains a dual

[32] The structure here is parallel to that described in Hallin (1986) of 3 concentric spheres: the sphere of consensus, which is assumed to be common knowledge and both obvious and inviolate; the sphere of legitimate controversy, in which problems may be raised, challenged, and discussed; and the sphere of deviance, in which "people and issues deemed unworthy of serious consideration reside."

potential: it can become increasingly hostile to new users and self-consciously élitist, or it can remain open to a wide range of participants from differing backgrounds (Evans, 2000). While Slashdot may remain "news for nerds," the community must come to recognize a growing range of computer professionals, that "are all nerds now" (Simon & Napolitano, 1999).

The converse is also true: there is little that is *not* news for nerds. Consider the comparison found in table 3-3, breaking down the subject matter in topics from the first ten days of 1999 and the first ten days of 2001. The source of material remained relatively similar, with about 40% of stories coming from the "traditional" news, a bit over 20% coming from press releases and the web sites of organizations involved, a bit less than 20% coming from smaller web logs and individual home pages, and the remainder being original articles, interviews, and other content created for Slashdot. However, as figure 3-3 demonstrates, there was a change in the topics covered, with decreasing coverage of heavily technical issues and increased examination of legal and political issues. Given that the number of registered users increased at least twenty times[33] during this period, the change in topic is hardly surprising. Whether Slashdot can maintain its subcultural status, while continuing to attract the population of a small city, remains an open question.

[33] Estimated based on user IDs of posters in each period.

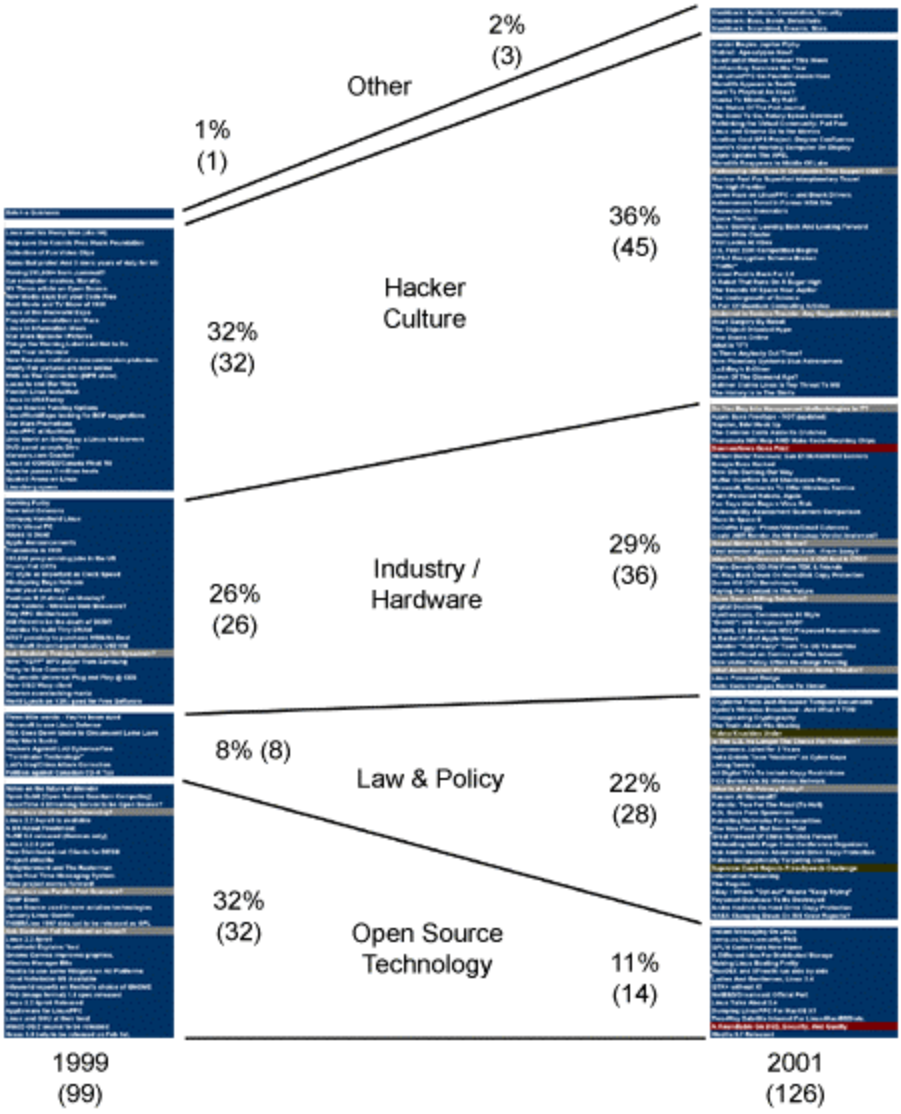

Figure 3-3 – Comparison of item topics in 1999 and 2001.

Is the viewpoint that has emerged from Slashdot communicated to policy-makers or otherwise acted upon? Certainly, within the small world of Open Source, a

mention in Slashdot can have a significant impact, and as we have seen, newspapers sometimes use Slashdot as a tip sheet and source of information on popular techie sentiment. Whether and to what degree this can contribute to political and social change will be left for the final chapter. Here we may conclude simply that Slashdot, while presenting the world through nerd-colored glasses, provides an interesting and influential example of a form of on-line communal interaction.

Summary

This chapter began with a set of questions about the observable culture of Slashdot, questions that came of a desire to see whether the culture of open source affects the nature of the discussion that takes place on Slashdot. In addition to these questions, the preceding pages have provided examples of how the moderation system works to shape consensus and content on the site.

Three things seem clear. First, there is a learning curve for those who come to the site. In other words, the requirements of a "good" post are often learned the hard way. Once they are learned, they are often ignored, and users post their own ideas. Second, the process of collaborative filtering and discussion seems to work well, elevating those elements of the discussion that are particularly germane from an objective perspective. Finally, there is a set of knowledge that makes one a member of the Slashdot community. Rather than being directly related to computer programming

or open source, this knowledge seems to be trivial, of no practical purpose other than creating a community and excluding outsiders. Humor and sarcasm also play a pivotal rôle in creating a feeling of inclusion among the community. This allows for a diversity of content and of users that extends far beyond what might be expected given the reputation of the site. The latter two characteristics are found to varying degrees in other on-line discussions, including those on Usenet. In both cases, they serve as a proxy for a hierarchy that is not established through more traditional status markers. The explicit scoring system, though, originated with Slashdot, and provides a chance for those in the community to silently enforce the informal structure of the site.

Examining the site itself provides only half of the story. It is easy to forget that this commentary is driven by other content on the web. Often, discussions bring up not only the article under consideration, but supporting materials as well. These references could be considered as part of a larger textual analysis; that is, they could be considered intertextual elements within a conversation. The following chapter takes a different approach, recording all of the links for a constructed week and following them all. The result, explored further in chapter five, is an indication of the hyperlink structure that surrounds Slashdot. While this chapter explored the internal structure of Slashdot, and how disparate ideas are linked together, the following chapter analyzes the external structure of Slashdot within the larger context of the web, and again

provides some indication of how Slashdot acts as a system for connecting fairly divergent topics and social groups.

Chapter 4:

Slashdot's Web Region

> "Would you tell me, please, which way I ought to walk from here?"
> "That depends a good deal on where you want to get to," said the Cat.
> "I don't much care where," said Alice.
> "Then it doesn't matter which way you go," said the Cat.
> "—so long as I get *somewhere*," Alice added as an explanation.
> "Oh, you're sure to do that," said the Cat, "if you only walk long enough!"
>
> – Carroll, 1981, p. 64

It is easy to look at the discussion on Slashdot and ignore the information environment that surrounds it. Of course, there is the larger information environment in which the hundreds of thousands of users are situated in their "real lives," but there is a much more immediate connection to the web sites that surround Slashdot by linking to it and being linked to from it. Both the structure of these connections and the content of the sites Slashdot links to are of interest. This chapter provides some indication of the web region[1] of Slashdot, and speculates how this region influences the experience of using Slashdot and the role of Slashdot as a "tunnel" between other sources of information. The first four chapters explored the technology of Slashdot, which is defined as the complex structure containing the formal and cultural elements

[1] "Neighborhood" is a much better word than "region" for describing a semi-enclosed linkage space, as it better implies the relationships involved. Unfortunately, the word "neighborhood" already has a very specific meaning in network analysis and graph theory: the collection of links entering and leaving a single node. We are looking at more than the neighborhood of the Slashdot site (if only barely). "Community" is widely used to describe a related cluster of linkages, but it is already well-worn in other contexts in earlier chapters. To avoid neologisms ("hyperplex" seems to me a very good word for this), I will use "region."

of the site. These structures determined how consensus is reached among a large number of contributors. In the pages that follow, we will look at the web context, and what it means to be a single site within a larger network of sites around the world.

In the days before widespread use of the printing press, the manuscript existed in its own intellectual space. While some familiarity with widespread religious and philosophical doctrines could be assumed within large geographic regions, there was no larger body of literature in which an author could situate her work. This changed somewhat with the diffusion of the printing press and mass produced books. For the first time, authors could assume that their readers would have, or could get, access to a standard library of works (Eisenstein, 1979). The World Wide Web has taken a further step in the same direction. Non-networked sources still predominate, as a glance at the bibliographies of papers posted in some of the peer-reviewed Internet journals clearly shows. More than ever, though, information that is referenced on the web can be retrieved immediately (or nearly so) with a click[2]. Co-citation analysis could reveal spaces of interaction within traditional literatures, but the internet makes such spaces much more immediate and influential.

This is particularly true of a site like Slashdot. Most of the topics on Slashdot link to one or more websites that provide for the content of the discussion. Even in the

[2] There are now a number of sites that act as repositories for academic work and "e-prints," especially in the hard and applied sciences. NEC's Citeseer (*http://citeseer.nj.nec.com*), takes this a step further and automatically analyzes, categorizes, and links citations of papers in its database. Several of the papers cited in this chapter are available (or at least referenced) in Citeseer.

case of material that is unique to Slashdot ("Ask Slashdot," feature articles, reviews, and interviews), the discussion that follows invariably links to outside sources. Indeed, one of the ways Slashdot has had the most effect on the world of computing—the "Slashdot effect"—is directly related to the place Slashdot holds within the larger web. To understand Slashdot, you must understand its relationship to the sites that surround it.

Web Links and Content

The web is driven by the concept of hyperlinks—without hyperlinks it becomes simply a system for delivering electronic documents, a system not unlike email. Despite the difficulties that come with hyperlinked web space (the inability, at least at present, to effectively index the web, for example), it allows for a particularly dynamic structure, in which authors determine an associative space for their topics. Understanding the nature of the web as a whole is made more difficult because of the complexity of these hyperlinked structures. While a structure consisting of nodes that could link to a limited number of its neighbors (like a cellular automata) is relatively simple to understand because of its small number of dimensions, the networked world allows for a number of dimensions that vastly exceeds systems we normally experience. Even the structures of simple web sites are often difficult to imagine as a

whole, and more sizable segments of web space quickly become too difficult to understand intuitively.

Mathematical approaches to modeling the web, while not intuitive, allow for an understanding of how hyperlink structure might affect meaning on a collective scale. By looking at the actions of individual (and collective) web authors, we recognize that they generate hyperlinked structures that "emerge" from the individual process of linking. Detecting these patterns has already found a use in indexing the web. In fact, the first attempts at indexing also led to the first attempts to describe both the pages and the connections on the web. Tim Bray, while gathering a pages for the Open Text Index, found that there was a great deal of useful information that could be mined from the formal aspects of the web, and not just the content (1996). The Google search engine is becoming the most popular search engine on the web because unlike search engines that index only the textual content of a site, Google also examines the hyperlinks that lead into and out of any given page. Based in part upon the simple assumption that links to a page indicate its value to a wider web community, Google is able to provide more useful search results. Work continues in this area, based on the progress made by those at Xerox PARC (Pirolli, Pitkow, & Rao, 1996), the CLEVER project at IBM (Kleinberg, 1998; Chakrabarti et al, 1998) and Digital's "Web Archeology" program (Bharat et al, 1998). As more complex approaches to analyzing web structures are developed, especially in conjunction with improvements in

automated content analysis, we are likely to see further breakthroughs in web indexing, including better web-page categorization, searches by example, locating mirrored hosts, and more geographically constrained searches (Henzinger, 2001).

The practical advantages to indexing and surfing, however, were discovered only incidentally to work being done on uncovering the social structures implied by hyperlink patterns. A number of researchers have taken on this task, arguing that hyperlink structure is in many ways the best indication of a web-based community. At the basis of such a claim is the assumption that computer networks in some way infer social networks, that hyperlinks are made by authors for social reasons (Wellman et al, 1996). Indeed, the connection between communication networks and social organization has a long history. It was suggested that mapping the structure and flow of earlier electronic media could provide a good indication of cultural and social cohesion (Casson, 1910, esp pp.96-7 ; Deutsch, 1953). The interweaving of hyperlinks with the rest of the web is something that is seen as important to more than researchers and indexers. Those who create commerce sites recognize the value of a link, and are quite willing to pay for one. Likewise, those hoping to create political change look for the opportunity to create interconnections. Patricia Radin, for example, notes that in creating a site centered on resources for biotechnology policy, "not surprisingly, the first reaction… came from several non-profit organizations, which immediately linked their own pages to it and requested reciprocal connections" (1995). Generally, though,

authors think more about individual links than they do about the linkage structure at large. It just happens that the motivations of these individual actors tend to form patterns in the aggregate.

There are a number of reasons authors include hyperlinks on their web sites. At a basic level, internal hyperlinks are necessary to be able to navigate a web site. External links often are added to allow for access to related information. As Steven Johnson (1997) notes, hyperlinks are fundamentally associative in nature, they make a new whole out of fragmented parts. He draws an analogy to Dickens who made use of "associative links" in his novels to bind together what seemed like disparate life-worlds. The case of Slashdot is more complicated, since any given page (topic) is likely to have links dedicated to navigation within Slashdot and to its "family" of sites[3], as well as links to contributors' home pages and pages that provide further information based on the topic of discussion. Discerning the intent of these links would be a relatively difficult task[4].

While the motivations of individual authors may be difficult to analyze, at larger scales, "emergent communities" can be found. By "trawling" the web, bipartite subgraphs of hyperlink connections can be detected that bind together "implicit communities" (Kumar et al, 1999). Terveen and Hill (1998) have also looked at how

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[3] With the purchase by Andover.net, one of the most visible changes was the addition of links to other related sites owned by Andover. Information on these sites can be found at *http//:osdn.net*.

[4] Though not impossible. One could assume the nature of a hyperlink by its position on the page, and theoretically, only those links within message text could be gathered. However, excluding links because they do not fit the model suggested seems unadvisable.

structures of co-citation, and the density of such structures, can demonstrate the existence of a certain sort of community. These differ from commercial sites, which tend to be "dead-ends" not linking to other related sites. Others have suggested that web sites are an example of a partially populated network, and the role of "shortcuts" within that network allows for particularly effective forms of exchange to emerge (Watts & Strogatz, 1998). Examining hyperlinks rather than, or in addition to web content, allows for an understanding of social organization that even participants themselves may be unaware of (Adamic & Adar, 2001).

Slashdot does not quite conform to the types of sites investigated thus far. In terms of structure it seems to play the role of a web portal. While many sites link to it, most of them are not sites that have been linked to from Slashdot. Its role is not exactly that of a bridge, which would exist between local maxima (see Scott, 2000, pp.98-9). However, it does seem to present an example of weak ties to the lower layer of networks, acting as a sort of massive back door to many sites: a tunnel, if you will.

Slashdot's Region

The approach taken here is much simpler than those described above, as it hopes to answer a question smaller in scope. We begin with the assumption that if web regions exist in other contexts, it is likely that the links surrounding Slashdot describe some form of web region. Given the discussion above, one might expect that we want

to be able to describe Slashdot in respect to its surrounding "terrain." We could, for example, measure its centrality within the network, or its "rank" in terms of inward and outbound links. Both measures are constrained by the available methods of data collection.

If we wanted to discover Slashdot's centrality in the web at large, we would need to begin with some significant pseudo-random sample of the net and determine how these sites linked with the Slashdot site. As is perhaps already obvious in the phrasing of the previous sentence, network approaches do not work well with samples. Given a partially interconnected network (like the World Wide Web), one can use large samples to estimate network metrics. But even if we could make inferences from perhaps as little as a third of the web, this would still be on the order of a billion pages. Google bases its decisions about page rank on a database of over 1.3 billion pages.

As a result, the network data collected was ego-centric: that is, the collection began with Slashdot and moved outward across links. Given this starting condition, we have already inferred the centrality of Slashdot by our collection methods. There are several possibilities for overcoming this problem. We could, for example, begin by collecting some number of random ego-centric networks in addition to Slashdot's, and then compare the overlap of these networks. However, in order to accomplish this, again, it would be necessary to collect several orders of magnitude more pages than

we would to describe Slashdot's region alone. Below, an alternative method—measuring local cliques—is described.

By beginning with Slashdot as the starting node, and by eliminating it from the analysis of the network, we can observe the degree to which the subregions ("suburbs"?) of Slashdot are interconnected, how they cluster, and how this relates to the content of those pages. Unfortunately, while this excludes some of the quantitative measures that would otherwise be open to us, it does answer some of our questions about the web "context" in which Slashdot exists.

This also explains why the Slashdot region is difficult to compare with a region surrounding some other popular site on the internet. The argument presented in this dissertation is that Slashdot represents a unique site, and a vanguard for other sites that follow it. The only way to show this would be to demonstrate that it was structurally dissimilar to other sites on the world wide web. Network analysis may provide some of the tools to do this, but selecting likely candidates for doing such a comparison is difficult. One need not do a detailed analysis to recognize that the hyperlink-rich pages of Slashdot share little with traditional news sites on the web. Stories on the *New York Times* online often list two or three URLs (not links) for further information, while the *San Francisco Chronicle* rarely provides links, for example. CNN provides a few links on occasion, and even a freewheeling discussion of sorts, but it is clearly less active that Slashdot, and the emphasis is placed on the content of the articles rather than

input from the community. There are many systems that use the freely available Slashdot code, or a similar design (kuro5hin, for example), but none of them attract an audience the size of Slashdot and they could easily be considered to be following in the footsteps of the Slashdot model. None of these offer credible options for a fruitful comparison.

The Approach

Beginning in early March, the links leading from Slashdot to other parts of the network were collected using a "crawler" or a program that exhaustively follows links and records information about each page[5]. The initial plan was for a four-deep crawl from all Slashdot postings from November of 2000 to the end of January 2001. Although, as noted in earlier chapters, an archive of most of the topics posted on Slashdot in the last several years remains accessible on the web, many of the pages that these topics pointed to were deleted long ago. In fact, even in these more recent topics, many of the links were dead. This is hardly surprising given the currency of the news. Some may also have been victims of the "Slashdot effect" and deleted or removed the target pages to avoid continued spikes in traffic.

This original plan was abandoned in favor of a more shallow crawl of three pages deep, with three sets of links recorded. That is, links outbound from Slashdot led

[5] Please see Appendices B and C for a description of the crawler and a more detailed account of data collection.

to a first set of pages, those to a second set of pages, and those to a third set of pages. The hyperlinks from the third set of pages were also recorded, but the targets of those hyperlinks were not collected (see fig. 4-1). This was a fairly large crawl. One study estimated that any two pages on the web are separated by 19 links (Albert, Jeong, & Barabasi, 1999), while another claimed that only 24% of sites are connected at all, and that the average path length between these is 16 links (Broder et al , 2000). Thus, a search of all length 4 paths from Slashdot is of considerable size. The crawler software ("Informicant Crawler") was adapted from one used in earlier research (Halavais, 2000). Although the crawler was altered to increase speed, because the network was more dense than expected, the large scale crawl was aborted, and a smaller, constructed week was used instead. The fastest crawlers, working on very fast servers, can collect upwards of 80 million pages a day, while single-threaded limitations and unoptimized parsing routines meant that the Informicant, in its present implementation could gather at most about 45,000 pages a day under optimal conditions.

The week was constructed by using the first week in January as a guide for the number of topics, and drawing randomly from the three month period (according to the model distribution of days of the week) in order to create the week. This constituted 82 posts. The figures in table 4-1 indicate the number of links and nodes (pages) at each depth. All of the pages are unique; for example, if a page at level 2

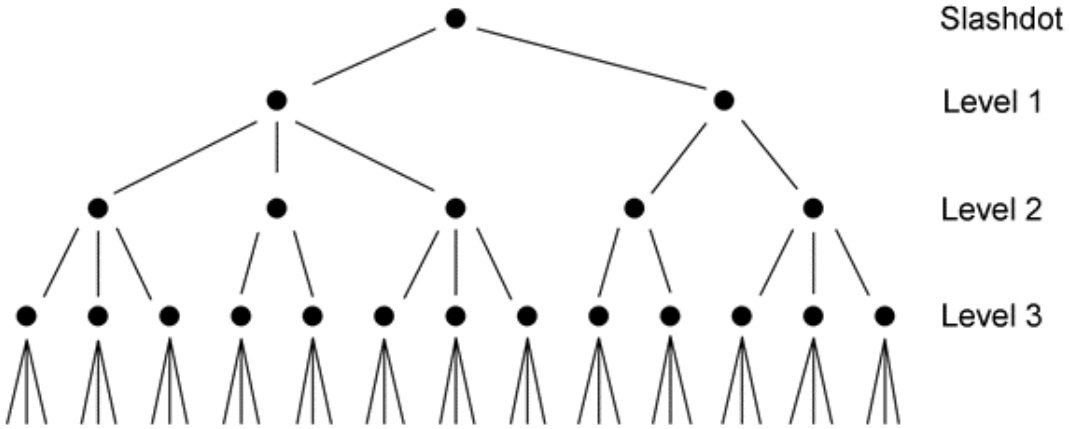

Fig 4-1 – Three deep crawl, with links to fourth.

links back to one of the originating 82 pages, it is not counted again. As a result, all links are also unique—though they may link to a page that has already been crawled, they represent a unique link between two pages. Total outbound links from level 3 to unique uncrawled pages numbered just under 2.5 million[6]. Given the rate at which crawling was being completed, it was decided that a 3 level crawl would be sufficient[7].

[6] That is, the number of links were more on the order of 20 million, but on average something like 9 links went to each of these sites, and many were internal links or links to pages already crawled.

[7] In some forms of network analysis, either for hyperlinked networks or in more traditional social network analysis, there is a clear indication of what is and is not included in the network that is being analyzed. In this case, there was no such clear differentiation, and the selected depth was arbitrary. More important than the extent of the crawl outward (how far from Slashdot you could get) was the depth necessary to demonstrate cliques. Again, this is an arbitrary length, but given the sparsity of the clusters surrounding Slashdot, the executed crawl was sufficient, especially given the difficulty in performing an analysis on such a large set of data.

Table 4-1 – Pages crawled of constructed week.

Level	Pages
0 (Slashdot)	82
1	3,215
2	36,966
3	347,477
Total	387,740

This data was then reduced to the domain level. Note that while *only* links leaving the Slashdot domain were counted between level 0 and level 1, at all subsequent levels, internal and external links were counted. Thus, a link could be made to the enormous everything2.org site, and pages in level 2 and 3 would be accumulated only within this domain, never leaving it. In fact, several of the heavily linked sites from Slashdot—especially Everything2, Freshmeat, Fatbrain, Amazon, and IMDB—are extraordinarily large and dense (heavily interlinked) sites that ended up taking up much of the crawl. Since authors intend sites to be taken as a whole (and pages out of context may not make sense), the data was collected at the domain level. This does present issues with domains that host a large number of different cites; especially geocities, universities, and other large website providers. However, for the most part this allows for a more sensible analysis, and recognizes (or at least approximates) the difference between links internal and external to the site.

After unitizing the data at the domain level, we are left with 28,255 domains. These are stored in a directional network (a rectangular matrix), with multiple hyperlinks of the constituent pages summed for the "weight" of the directional link.

We will begin by looking at ways of differentiating this data by hyperlinks and content. First, though, we can make some descriptive observations of the data.

Domains Surrounding Slashdot

Given the "Slashdot Effect," the range of discourse the site itself supports, and the counter-cultural roots of the hacker ethic, we would expect that the sites surrounding Slashdot would represent a broad combination of technical information and cultural views. This is, in fact, the case. The top level domains give some initial indication of this (see table 4-2). It is unclear why so few .net TLDs appear in the survey. It may be that the .net registrations that appear in the Net Wizards survey of the entire web are little more than attempts to thwart domain name squatters. For example, Yahoo has registered yahoo.net, though it is the same site as yahoo.com. The same is true of Microsoft, Google, AltaVista, and many more. If this is the reason for the number of .net domains in the Net Wizards survey, combining the .net and .com categories would lead us to conclude that in terms of the commercial and the public sites on the net, sites surrounding Slashdot are representative of the web at large.

One notable difference is the richness of .org sites, coupled with what seems to be a fairly small number of "country code" domains (ccTLDs). Despite the "profit friendly" nature of the Open Source Initiative, there remain many within the community who frown upon commercial development. Open source companies

Table 4-2 – Distribution of Top Level Domains[8].

	Near Slashdot	Total Web
.com	60.6%	33.2%
.net	4.5%	28.2%
.org	12.8%	1.2%
US Educational	5.2%	8.6%
US Government	4.8%	2.4%
International	12.0%	26.2%

sometimes have both a .com and a .org address. Unlike the anti-cybersquatting motives of the companies noted above, these are often different sorts of sites. The site listed under .org treats the technology and the development of products, while the .com site often focuses on for-profit support, implementation, and customization[9].

Slashdot is unapologetically US-centric: "We readily admit this. Slashdot is run by Americans, after all, and the *vast* majority of our readership is in the U.S." (Slashdot FAQ). This might account for the 12% figure. Only 9% of the links on the average U.S.-based site links internationally[10], as of three years ago (Halavais, 1999). Moreover, the percentage in table 4-2 represents only links to ccTLDs (and the .int gTLD), not the very large number of .com and .org registrations to sites hosted overseas. Although the .com domains were not surveyed in this particular case, as

[8] Total web based on Network Wizards' (*http://nw.com*) January 2001 server survey. "US Educational" includes .edu and .us. US Government includes .gov and .mil. International includes all of the country codes (ccTLD) and .int. Figures do not add to 100% due to unrecognized cases: dotted decimals in the URLs around Slashdot, unspecified from Network Wizards.

[9] Jabber.com and jabber.org, for example. Debian (a Linux distributor) does hold both .com and .org addresses, but the .com address forwards to the .org address. For Mandrake (another Linux distributor), on the other hand, mandrake.org forwards to mandrake.com.

[10] The 9% figure includes both ccTLDs and gTLDs registered overseas. On the other hand, it also includes only a single hyperlink, whereas the 12% figure includes as many as three hops.

many as half of new .com registrations go to sites outside of the US. Particularly given the large number of .org domains, we can speculate that many of the gTLDs are in fact international. Since many of those who are involved in Slashdot create not-for-profit or small-scale sites, and since some countries are hesitant to issue domains to all comers (Hong Kong, for instance, required you had a trademark or business license, at least when it was still issuing ccTLDs), the number of international links may be quite a bit higher than that 12% indicates. In any event, we can tentatively conclude that the region surrounding Slashdot is more international than the region surrounding most sites.

A dictionary of key terms was created iteratively, in the hopes of getting a better feel for the content of the sites surrounding Slashdot. First, a frequency list was generated for the entire corpus: which constituted the first 200K bytes on each page. From this frequency analysis, the most common terms were grouped into the categories listed in table 4-4. Note that words were sometimes used in more than one category. A word frequency was generated for each domain, and this was compared with the dictionaries. The total number of hits was divided by the total word count to generate a score for each domain between 0 and 1 in each of the subject areas. Table 4-3 indicates the *highest* score, though most pages received a score in multiple categories.

The picture presented in table 4-3 gives some indication of the topic matter on the web sites surrounding the board. There are, of course issues of possible misrepresentation, especially in cases like the "Linux" category, where unambiguous keywords were easier to discover. There seemed to be few errors in categorization, and a spot check of 100 pages found the categorization to be relatively effective (92% of the pages were in agreement with manual coding). Unfortunately, it is far more difficult to separate items by genre, which would be very instructive. Although some work has been done on automatic genre detection, the tools needed are still in their infancy (Kessler, Nunberg, & Schütze, 1997). As it stands, sites that fall under speech and privacy range from CNN to a personal blog.

Table 4-3 – Topic categories of text in surrounding domains.

General Topic	Domains
E-Commerce	16%
Linux	19%
Programming	6%
Hardware	7%
Politics & Policy[11]	0%
Speech & Privacy	2%
Intellectual Property	7%
Arts & Entertainment	13%
Science and Technology	12%
Other	18%

Understanding the content of the region around Slashdot does give us some reason to believe that it binds together a reasonably wide range of topics. On the other

[11] This category was retained because although very few domains had this as their primary category, many had scores in this category.

hand, it would be difficult to assume that nearly over 30,000 sites could be very focused. In order to better understand how these topics are linked to Slashdot, we need to gain some idea of the topology of the region, its structure.

Structure of Surrounding Network

Although a survey of the type and content of sites surrounding Slashdot is interesting, and will be of some help in the final chapter when we examine how Slashdot relates to the rest of the media environment, equally important is the structure of that environment. Knowing that these domains exist in some proximity to Slashdot (in terms of clicks) does not provide us with a good idea of the configuration of the sites in the region. What we need is something akin to a road map of the area, an idea approached more in earnest in the coming chapter. But even barring a graphical depiction, we can usually define areas a bit. One of the ways we can do this is in terms of density. Unlike Von Thünen's idealized city, real world cities develop their own suburbs—concentrations of structures and people outside of the city center—and those suburbs are in turn further variegated.

The domains that exist beyond Slashdot are similarly clumped by association. If we wanted a very basic model, we could place domains in bands, moving outward from Slashdot itself. But this would provide only the barest improvement to understanding that space. Much better would be some indication not only of how these

domains link to *Slashdot*, but how they link to *each other*. To that end, a hierarchical cluster analysis was done.

Some of the other network measures that are normally available are not applicable in this case. As noted, traditional measures of centrality would not be helpful, given that Slashdot was the starting point of the data collection. Consider, for example, what would happen if Yahoo was two steps from all of the sites at the periphery of the 3-deep crawl. From the perspective of the data obtained, Slashdot would appear to be the clear center of the network, when in fact it was nowhere near as central as Yahoo, just outside of the crawl horizon. While the method of data collection makes measures of centrality suspect, there is still much that can be drawn from it.

We can, for example, make some observations about the density of the interconnections surrounding Slashdot. Density is usually defined using two parameters: the "inclusiveness" of the network, and the sum of the degree of its points (Scott, 2000, pp.70-81). The former of these would be irrelevant in this case if we were including Slashdot, as all points are, by definition, connected by some path to Slashdot. However, a surprisingly large percentage of the domains linked to from Slashdot do not link any further. 13% (3,644) have no external links at all, and an additional 22% (6,436) have links external to the domain but not to another site among those crawled. These numbers are fairly shocking. This is especially true considering

that full domains were considered. That is, if yahoo.com has a link to auction.yahoo.com, this is not included in the above totals. Likewise, when the pages in www.handspring.com have a single link to stats.superstats.com, a company that provides website metrics, it is counted as having an outbound link, when that link is of dubious importance to the average surfer. If anything, the 55% inclusion is *overestimating* the degree to which the region surrounding Slashdot *sans Slashdot* is connected. Again, we cannot use this to assume the centrality of Slashdot, but we can see that it serves as the sole intermediary between a significant number of sites.

While we could measure the density between the domains, studying the density of pages gives us more comparative data. The density based on the degree of its point is usually expressed at a fraction of the fully connected graph. Of the over 20 million links from sites in level 3 of the crawl (20,239,015; requiring 1.1 Gb of storage for links from this level alone), a bit less than a quarter were to nodes already collected. The 82 pages and outbound links from Slashdot were again excluded. The density of the graph is then given by

$$\frac{l}{n(n-1)}$$

where l is the number of directional links and n the number of nodes. This yields a density of just over 0.00005; a very sparsely connected network. A more comparable metric is the mean degree for each point—that is, the number of links to unique pages from any given page—which measures 20.5. The average was just under 8 in an

earlier study of over 50,000 web pages in 1998 (Halavais, 1999), and when Brin completed his survey in 1996, it showed that only 10% of pages on the web had from 16 to 31 links.

What is to explain this high density? A great deal may be attributable to some of the dense, data-rich sites in the immediate neighborhood of Slashdot. Any given page on sites like Amazon, Barnes and Noble, Everything2, and IMDb may have more than one hundred links, most of them to other pages on the same site (particularly in the case of the commercial sites). This points to a basic problem with overall density measures. Even when aggregated to the site or the domain level, we are left without any understanding of the degree to which the region contains clusters, and the meaning of those clusters.

Watts and Strogatz (1998) suggest a coefficient of clustering *C* that is then applied by Adamic and Adar (2001) to a sample of home pages for students at MIT and Stanford. *C* is the same measure of density noted above, applied to each "neighborhood" around a node (domain), that is, to the nodes one link away. To use the terminology of Adamic (1999): "If a vertex v has k_v neighbors, then at most k_v (k_v - 1) directed edges can exist between them. Let C_v denote the fraction of these allowable edges that actually exist. Then *C* is the average over all v." In the case of the domain network[12], the coefficient *C* is 0.11. This is at least half the clustering coefficient

[12] Stripped of all links to domains that were not collected, and turned into a binary network: that is, only the presence or absence of a directional link was counted, not its "strength."

measured in the student networks Adamic and Adar measured. However, it is greatly affected by the large number of single-parent, dead-end domains, which are incapable of having an individual clustering component.

We may compare this average (which was exclusive of Slashdot) with the coefficient of clustering for Slashdot itself. Working only with domains, there was a total of 2,735 outbound links. Of a possible 7,477,490 directional links (not including back to Slashdot) in a fully connected network of these domains, there were only 5,085, leading to a coefficient of 0.001. What are we to make of a site that is (a) heavily connected to other sites and at the same time (B) very unlikely to be part of a local cluster?

The "small world" model on which both Watts and Strogatz, and Adamic and Adar based their analyses argues for the "strength of weak ties." A 1973 article by that title (Granovetter) proposed that, perhaps somewhat counterintuitively, the weak social ties between individuals, their extended rather than close social network, was very important to the diffusions of information: "whatever is to be diffused can reach a larger number of people, and traverse greater social distance…, when passed through weak ties rather than strong" (p.1366). He goes on to show that weak ties are what allow for the propagation of innovation from the first adopters to the early adopters[13].

[13] This model can be seen in earlier experiments in diffusion. DeFleur and Larsen, for example, had noted during their experiments in diffusion during the early 1950s that children propagated messages much more quickly than did the adults in a community. They concluded that it must be do in large part to their physical mobility and more frequent interaction with strangers (1987).

Moving beyond this collective view to a more specific look at interactions is difficult. The challenge of identifying clusters in such a large data set was daunting, and though clustering problems of this magnitude are not unheard of—in fact they are widely encountered in areas as diverse as astrophysics and calculating "other customers who purchased this book" recommendations at Amazon.com (Murtagh, in press)—mainstream statistical packages could not handle the link matrix[14]. As a result, a short script was created to implement a simple hierarchical clustering based on pair group averages[15]. This is not a perfect solution, but is sufficient to allow for the analysis undertaken here. Faster methods are available as are methods that will work well with directed graphs (e.g., Nieland, 2000) and successful use of self-organizing maps (Kaski, 1997), but this approach is sufficient for our purposes.

Clustering from linkage information is fairly straightforward, as distances are already provided in the form of hyperlink strengths (i.e., the total number of hyperlinks between two domains). While an attempt was made to cluster domains by topic, this met with only minimal success. There were a total of 13 categories for

[14] At least not with the relatively limited working memory on systems available. Neither SPSS nor UCINET were able to process the large matrix, and MVSP was unable load more than about 8000 nodes without running out of memory on a 512 MB system. Neither principal components analysis nor multi-dimensional scaling procedures work well with very large data sets. The program written, while slow, made more effective use of stored values to complete the task. This will be of more importance in the next chapter when a metric mapping of the space is attempted.

[15] The classic agglomerative clustering algorithm follows the straightforward recursive removal of the most connected clusters. The distance between clusters was calculated as the mean link strength between each domain in one cluster to each domain in the second cluster, which means that scaling can run from n^2 to $n^{(n-1)}$ depending on the density of connections. Luckily, though dense when compared with the rest of the web, hypertext webs tend to be fairly sparsely connected, and the degree of each node was small relative to the size of the entire matrix.

topical areas. Some of these were collapsed into Intellectual Property in table 4-3—namely DeCSS, Patent, Copyright, and Trademark—and "privacy" and "free speech" also had separate dictionaries. These categories were not disambiguated, and some terms appeared in more than one dictionary. The highest ranked domains in each category were also noted, and can be found in table 4-4. It is surprising that so many large sites made it to the list, especially given that the rating system provides an advantage to sites with low word counts. Of course, at most three pages from each domain was taken, and these are unlikely to be representative of the domain as a whole. It is also important to note that many of sites in the crawl were written in languages other than English, and would fail to be categorized correctly.

Table 4-4 – Top domains in each category.

General Topic	Domain
E-Commerce	amazon.com
Linux	oreilly.com
Programming	oreilly.com
Hardware	planethardware.com
Politics & Policy	emory.edu
Speech	www.eff.org
Privacy	ciac.llnl.gov
DeCSS	www.cs.cmu.edu
Patent	www.bustpatents.com
Copyright	opencontent.org
Trademark	www.eff..org
Arts & Entertainment	www.imdb.com
Science and Technology	www.xs4all.nl

Each domain in the crawl was then scored against these dictionaries, receiving a point for each term, divided over the total word count of the site. This yielded a floating point score between zero and one. Similarity between each node was calculated as the sum of the highest pair of scores. For example, if site A had scores of {0.0005, 0.003, 0.003} for Linux, programming, and hardware (and zero for all other scores), and site B had scores of {0.001, 0.001, 0.0} for the same categories, the link would be recorded as having a strength of 0.004, the sum of the scores for hardware-related keywords. Unfortunately, as is likely obvious from the above description, clustering in this manner was functionally equivalent to a simple ranking procedure based on the dictionaries. Clustering on the basis of linkage structure provided more insight.

Hierarchical clustering can proceed top down (bifurcating a cluster at each step) or bottom up, agglomerating the "nearest" pairs until the entire network is a single cluster. The result in either case is the familiar dendrogram, as well as (if stored) new connection matrices at each stage. If matrices are stored at various levels during the process, it allows for the ability to change scale and browse to different levels. There is no easy way to graphically depict these clusters, especially at a large scale, but we can describe the characteristics at the larger scales. Of particular interest are agglomerations that unite large clusters, rather than just adding a new domain.

These correspond to the most important fissures among groupings, measures that would be visible in, for example, principal components analysis (PCA).

In order to find these major divisions, the percentages of elements in each side of united clusters were recorded for each step in the cluster analysis. For example, at step 300, a cluster of 20 is joined by one more individual domain. This agglomeration is stored as 1/20 or 0.05. The score is from 0 to 1 (the reciprocal is taken for those over 1), with lower numbers indicating smaller clusters joining larger ones, and those approaching 1 indicating the joining of clusters of fairly similar size. This is, of course, not always an indicator of significant divisions. Especially at the earliest stage, when cluster sizes are small, this is an unreliable measure of significance. But as the agglomeration proceeds, the spikes where large clusters join other large clusters are both far less frequent and far more significant.

These spikes tend to be rather small even at later stages. For the most part, the distribution seems to follow a clear inverse power law, with some noise. A few of the early spikes are explained by clusters of sub-domains that are heavily interlinked[16]. In other cases, large clusters were united by an earlier addition of a domain that acts as a bridge. Often, these bridges are intentional—bookmark lists or directories, for

[16] This could have been avoided by using only secondary domains (e.g., collecting all of the yahoo sites with domains that ended in yahoo.com), but this would have unreasonably flattened no-ip.org, yi.org, and other free name forwarding and dynamic DNS providers used widely by those in the open source community.

example[17], but an important percentage of these are blogs or other forms of vanity sites. These personal sites sometimes serve to link Slashdot with corporate web sites. This analysis, in relying upon the domain name, unfortunately missed opportunities to better measure the role of these smaller sites. (Many Slashdot contributors have their own "vanity" domains, but far more have personal homepages that are hosted by their employers or schools.) A further investigation of personal pages as effective "weak links" would be valuable, if tangential to the present concern.

The view of the structure leads us to see it is dominated less by dense hyperlinked structures and more by individual sites, that may themselves be fairly deep. Those sites that are connected to one another do so not in large clumps but in gradually widening spheres. The few clefts that do exist tend to be bridged by small sites that are in some ways intentionally making those bridges. Slashdot appears to be at the core of a fragmented set of commercial and personal web sites. This corresponds well with the idea of Slashdot as a connecting hub, as a way of moving clickstreams to parts of the web that surfers would not otherwise visit. We can presume that many people go directly to Slashdot, having heard of the site from friends or from the mass media. But if Slashdot is a kind of tunnel to unusual sites, where do the users come from if not by typing in the URL?

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[17] For example, a domain with a directory page like *http:// www.beebware.com/ directory/ Business/ Industries/ Manufacturing/ Consumer_Products/ Toys/.*

Link To

AltaVista and Google both provide the ability to search using a "linkto" criterion, searching for sites that link to a particular page or domain. Since there is no way to backtrack along hyperlinks, this provides an especially valuable resource. If Slashdot represents a kind of tunnel for web traffic, it is reasonable to expect that at least some of that traffic comes from links on other sites. A search on these sites indicates that this is, in fact, the case.

AltaVista lists 181,964 pages with links to Slashdot, while Google lists 65,300. Unfortunately, both sites only provide the top few hundred ranked pages. Each of these have different ways of ranking pages. While AltaVista has a number of criteria for ranking pages, the most important for this search is how close to the top of the page the Slashdot link occurs (see Van Eylen, 1997). The Google ranking is based upon a determination of "authority" based upon inlinks and outlinks (Kleinberg, 1998). The topics of the pages forwarded to Slashdot appears in table 4-5. A total of 331 of the sites that appear in the results from Google, and a total of 33 of the pages listed on AltaVista, also appear in the region surrounding Slashdot[18]. While it is interesting to speculate on why sites closest to Slashdot are so highly ranked—one might conjecture that the links from Slashdot helped to contribute to these pages' calculated "authority"—there is not enough information for the reason to be clear.

[18] These are individual pages. The majority of pages for both came from OSDN.net and SourceForge.

Table 4-5 – Links to Slashdot.org, by topic of referring page.

Topic	From Google		From AltaVista	
Programming / Linux	649	76%	72	38%
Bookmarks, Homepages, & Blogs	76	9%	48	25%
Search Engines & Guides	28	3%	11	6%
News Sources	67	8%	24	13%
Other Web Boards	11	1%	18	10%
Other Organizations	20	2%	16	8%
Total	851		189	

This provides a partial indication of where Slashdot hits come from. We know that of all the links coming from the outside world, some portion are from pages Slashdot has already referenced. Given that we can only get at a small slice of those links, it is difficult to say what this percentage is. Ironically, given that the ranking criteria for AltaVista is relatively arbitrary, the pages provided may give a better representation of the remainder than the pages from Google. In either case, we know that some segment of those pages linking to Slashdot probably do not receive reciprocal links from Slashdot. Of those domains in the region, only 3,160 (about 11%) reciprocate that link. In some of those cases, it is in response to being "Slashdotted." That is, the link exists as a news item on the page linked or as an apology for interrupted service. In most cases, though, the site was already involved in open source issues and had a link to Slashdot somewhere.

There exists, then, three types of sites with links to Slashdot. The first group is those sites that link to Slashdot but do not have that link reciprocated. The most

frequent reason for this link is to follow up on a news item or to recommend it as a source of news and information. This constitutes a kind of recruitment effort by those familiar with the site. The second is the relatively small number of sites that are linked by Slashdot and reciprocate with a link. While there are a small number of individual home pages that do this, by far the largest group are those sites that act in some way as producers of open source software. The most tightly interlinked of these sites are (not coincidentally) owned by the corporation that owns Slashdot. The final group are those sites that are linked to from Slashdot and do not reciprocate the link. These are sources of information for the Slashdot community, and although the second group is important, this final group is what makes Slashdot successful. By being able to accumulate information from across the web, Slashdot shines a spotlight on items that are of import to its community, and then decides how and why (and whether) they are, indeed, important.

Slashdot Effects

Given that it seems to connect disparate and generally discontinuous websites to a larger audience, how is it that Slashdot is different from any large portal? We can make some qualitative observations about the differences. Most of these large websites—Yahoo, Google, AltaVista, Netscape, and the like—act mainly as search engines. Even large sites like the *New York Times* web site, which provide links to

pages that would otherwise go unvisited, provide little reason for visitors to go beyond the authoritative analysis presented. The citations are there mainly for the small number of readers who are interested in gathering more information on their own. Slashdot readers, on the other hand, are often drawn not only to visit suggested links, but to do further searching on their own in order to draw this knowledge into the discussion on the site. Slashdot creates a mass audience, but delivers to it messages that would otherwise go unnoticed.

Slashdot acts as a tunnel, getting to stories that are sometimes hidden in the hierarchy of a large site. An illustrative example is the link to an elaborate joke, posted on the Amazon site. Individuals can post reviews of books on Amazon's site. A review of *The Story About Ping*, a Chinese children's story book, appeared both on the Amazon site and was republished on Slashdot[19]. "Ping" is also a service that verifies the presence of any particular machine on a network. The review was written from the perspective of a technical manual, with amusing results. The point, however, is that this is an obscure page to link to on the Amazon site. The same can be said of most of the links emanating from Slashdot: rather than linking to the "front door" of sites, they tend to link to pages fairly well buried in the hierarchy.

In 2000, researchers at IBM suggested that the best way to envision the web as a whole was as a bowtie (see fig. 4-2; Broder et al, 2000). A portion of the web links

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[19] *http:// www.amazon.com/ exec/ obidos/ ASIN/ 0140502416 /ref=ase_slashdotorg0f/ 103-1090702-4376616* and *http:// www.slashdot.org/ books/ 99/ 01/ 31/ 1246212.shtml* .

outward, without receiving many links, a core group received links both from outside and from its own inhabitants (the "giant strongly connected component"), and a group of sites received links but did not link outward. This "bowtie" model enjoyed fifteen minutes of fame in the popular media. How does Slashdot fit this model? First, it is valuable to note that the Slashdot region has some properties in common with the global graph[20]. While we might be tempted to place Slashdot in the central core (and this would be justified given the model Broder et al present), Slashdot plays a more important role.

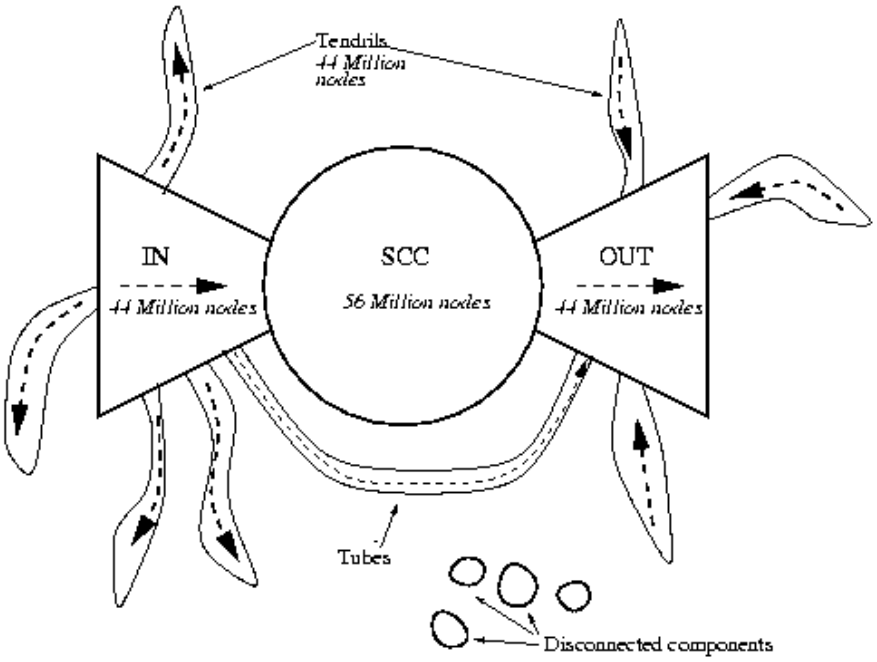

Figure 4-2 – The "bow tie" model of web structure (Broder et al, 2000).

[20] Though incidental to the present study, it would be interesting to investigate the degree to which any subgraph in the core exhibits similar properties.

The Slashdot Effect introduces a certain dynamism to this model. When a link to a site appears in Slashdot, it does more than push a huge amount of traffic toward that site. Those who visit the site through Slashdot, including individual web page authors and news organizations, create their own links to the information. As a result, the landscape of the web is changed. Slashdot's real influence is in creating new connections and opening up new doors, often creating shortcuts to parts of the web that would otherwise go unexplored. To draw on Rogers and Kincaid (1981, p.332), the networks surrounding Slashdot may do more than just provide content to people, it may affect who talks to whom over a fairly wide scale.

Summary

This chapter has attempted to provide some feel for the structure of the web surrounding the Slashdot site. At least within the immediate region surrounding it, Slashdot acts to connect otherwise unconnected sites. Measures of density of the sites surrounding Slashdot provide a metric that may be applied to similar studies of other web sites within the context of the larger web. Given some of the information generated by crawling the region surrounding Slashdot, we are able to surmise something of its function in the larger hyperlinked system of the web. In attempting to define this role, the term "tunnel" has been introduced, suggesting a structure that

allows for the connection of elements that would otherwise be separated in an increasingly balkanized world wide web.

While we can gain some understanding of the structure of the linkages surrounding Slashdot from the numbers provided above, the data is too complex to represent in any sort of nuanced form. The following chapter provides an explanation of a tentative approach to visualizing this complex data. The linkage structure determined in this chapter is reduced in complexity and presented as a simulated terrain. The result, at this stage, is too abstract to be analytically very useful, but provides an intuitive feel for the region surrounding Slashdot.

Chapter 5:

Visualizing Web Space

> The Web, when you're in it, feels like a place. It manifests, however, as a sequence of panels marching across your screen. This leads to an absence of perspective, of context, and finally, of comfort. Most of us who have worked with the Web, in particular those who have read Gibson or Stephenson, want to see where we are.
>
> – Bray (1996)

The concept of distributed hyperlinked spaces remains unfamiliar to many. That is, those moving through a space defined by hyperlinks tend to have a perceptual horizon that is very linear, defined mostly by the way web browsers work: allowing individuals to move only forward along particular paths or back. A person who is blind moves through a real world environment with a similarly attenuated visual horizon, but has cognitively mapped a much larger region. Even if we have never seen it at once, we all have some idea of how the neighborhood around our house is laid out. The same cannot be said for any significant part of the World Wide Web. Cognitive maps, the ideas we have about our environment, are usually built up out of individual experiences, and not by viewing from a vista. Yet that seems particularly difficult in the multi-dimensional space of the web. A visual metaphor is needed that ties this hyperlink space to something that is more experiential, to help us create a cognitive map that "helps to simplify and order the complexities of human-environment interactions" (Golledge & Stimson, 1997, p.224).

The previous chapter provided some indication of the density and clustering of the region defined by hyperlinks surrounding Slashdot. Unfortunately, that data is difficult to understand in numerical form. This chapter takes some tentative steps toward a visualization of that data. The ideal visualization would be both intricate enough to represent much or all of the data, yet would allow for a more general view as well. That is, a good visualization would be interactive enough to allow the user to "zoom in" to focus on particular details or have a large-scale view of the entire region. Ideally, it would include data not only from the hyperlink analysis, but of the content of these web sites as well. Unfortunately, such an advancement is beyond the scope of this chapter; indeed, it is worthy of an entire dissertation on its own. However, some alternative approaches to displaying the data are discussed in the following pages, along with a recommended approach to visualization and some first examples of what such an approach could yield.

As with any visualization, the hope is that a wider view of a large hyperlink network can provide insight into its structure in a way that other analyses might not, by providing a shift in perspective. Using network visualizations from a system called Netmap, for example, helped the Serious Fraud Office in the United Kingdom recently uncover a large scale fraud by visualizing the informal communication network between participants (Spense, 2001, pp.141-145). What would have taken many months otherwise was foreshortened by the ability to see the forest, and not the trees.

Visualization is an attempt to leverage the pattern-finding abilities of the human intellect, especially within the visual realm. The possibility for the use of computer visualization to better understand the "spaces" of computer networks has encouraged an explosion of attempts to depict the world of cyberspace, many of them described in a recent volume entitled *Mapping Cyberspace* (Dodge & Kitchin, 2001).

Even before hypertext broke the bounds of the individual computer, there was a need to map hypertextual spaces. That need has become more acute as the information environment on the web becomes richer, and a growing number of people are using the web as their main source of information. Moreover, advancements in understanding the structure of the web, which is neither uniform nor random, can be of great help to those studying other complex domains, or graph theory generally. As Hayes (2000) notes, "the World Wide Web has the advantage that it comes already encoded for computer analysis. The vertices and edges do not have to be catalogued; any computer attached to the Internet can navigate through the graph just by following links from node to node."[1] The ability to visualize complex networks has, for example, found an important place in biomedical informatics, and within the social sciences, there has been a swift increase in the use of visual explanations (Orford, Harris, & Dorling, 1999). One of the best ways of gaining rapid insight into these structures is seeing them in a natural form.

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[1] This is more than a slight overstatement. Nonetheless, collecting large-scale networking data from the Web is far easier that collecting network data in many other contexts.

This chapter examines some of the challenges of mapping hyperlinked spaces, provides some examples of such attempts, and maps the data from the previous chapter into a three-dimensional terrain, with the hope of providing some sort of intuitive feel for the structure of the region surrounding Slashdot.

Visualizing Multiple Dimensional Spaces of the Web

There have been a number of attempts to visualize the world wide web in different ways. Before hypertext even made the move to the web, designers tried to make some sense of the hyperlink structure (Horn, 1989). With the advent of the web, designers are once again relying on visualization tools to make clear the organization of large web sites (Kahn & Lenk, 2001). With a few pages, and even a few dozen pages, mapping the nodes and their connections is fairly trivial. Applications like Mapuccino (Maarek et al, 1997) and SGI's SiteManager[2] (fig. 5-1) provide useful views of medium- to large-size web sites. Most of us have been exposed to similar charts and graphs in other contexts—organizational charts, flowcharts, subway maps, and the like—and can quickly come to grips with the organization of the whole. Such charts of individual elements and connections become more difficult to draw and to understand easily as the number of points and the number of connections increases.

[2] *http://www.sgi.com/software/sitemgr.html* . Both are freely downloadable at present.

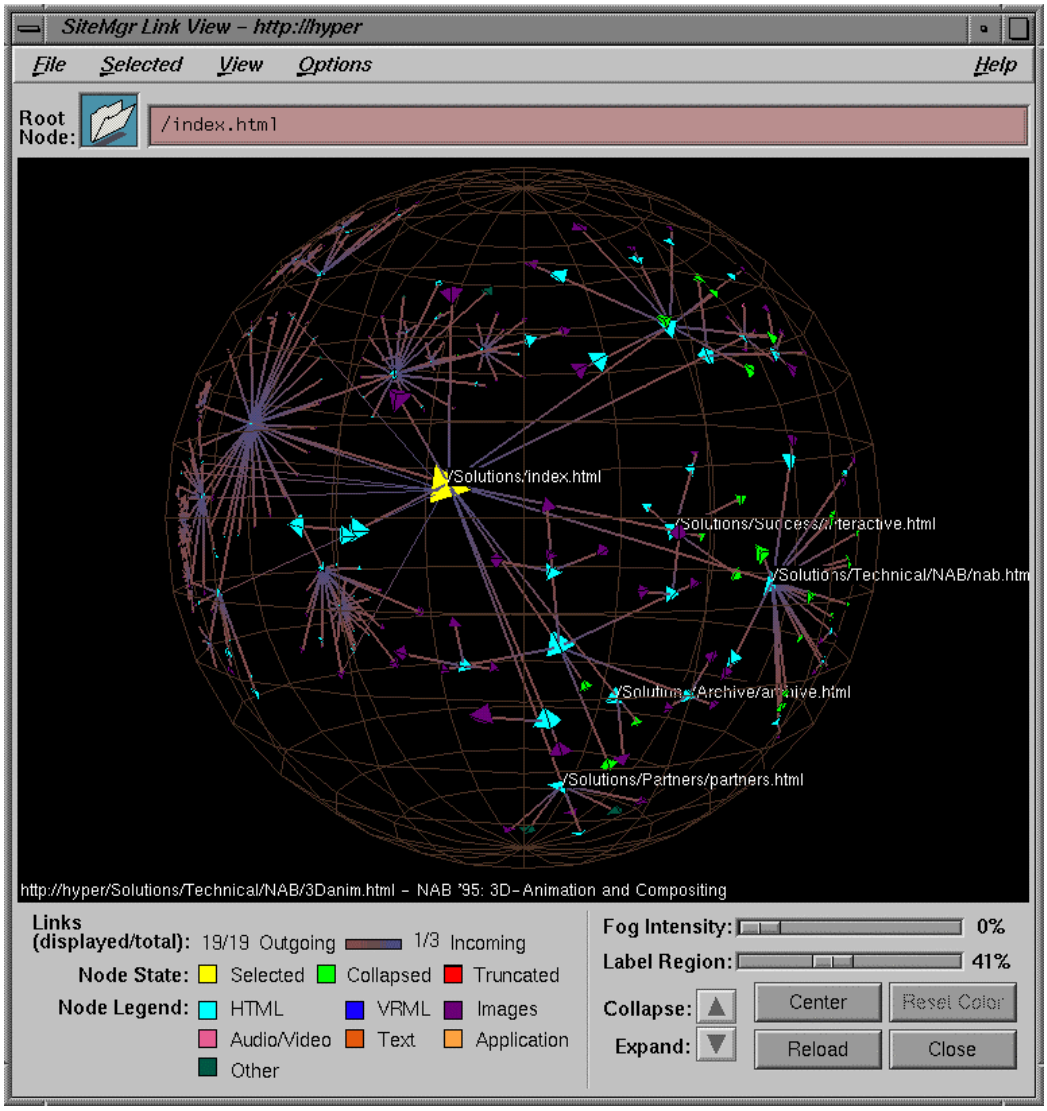

Figure 5-1 – SiteManager, by SGI.

The problem of visualizing social networks has already faced this hurdle, but solutions remain fairly limited. Linton Freeman (2000) provides a good overview of the various tools and approaches for visualizing social networks with point-and-line

representations, ranging from early hand-drawn maps to computer-aided approaches. But as he shows, once one moves from a few points to a few hundred points, the task becomes increasingly difficult. He documents the use of three-dimensional models, some of them borrowed from chemistry, for presenting network information, and describes some of the ways this complexity can be reduced using animation and immersive graphs (in VRML) to better make use of visualization.

Unfortunately, most point and line models do not scale well, even with the addition of a third dimension. There may be some utility if the data is aggregated, as shown by figure 5-2, the representation of a study of over 40,000 links between eight global cities. As figure 5-3 demonstrates, though interesting, as the models become more complex, such approaches lose their ability to provide much insight. This visualization is one of the earlier attempts to apply computer-created three-dimensional imaging to social network analysis. The difference between representing several dozen or even several hundred points, and presenting data on the scale gathered in the previous chapter, is qualitative as well as being quantitative (Wills, 1999). NicheWorks (fig. 5-4) is now part of a larger tool used to interactively visualize networks of up to a million nodes. Users can manipulate the visualization in real time in order to discover inherent properties and trends across large data sets. Other experiments demonstrate the ways in which visualization can aid in studying the

evolution of “web ecologies,” by animating graphs of the web structure changing over time (Chi et al, 1998).

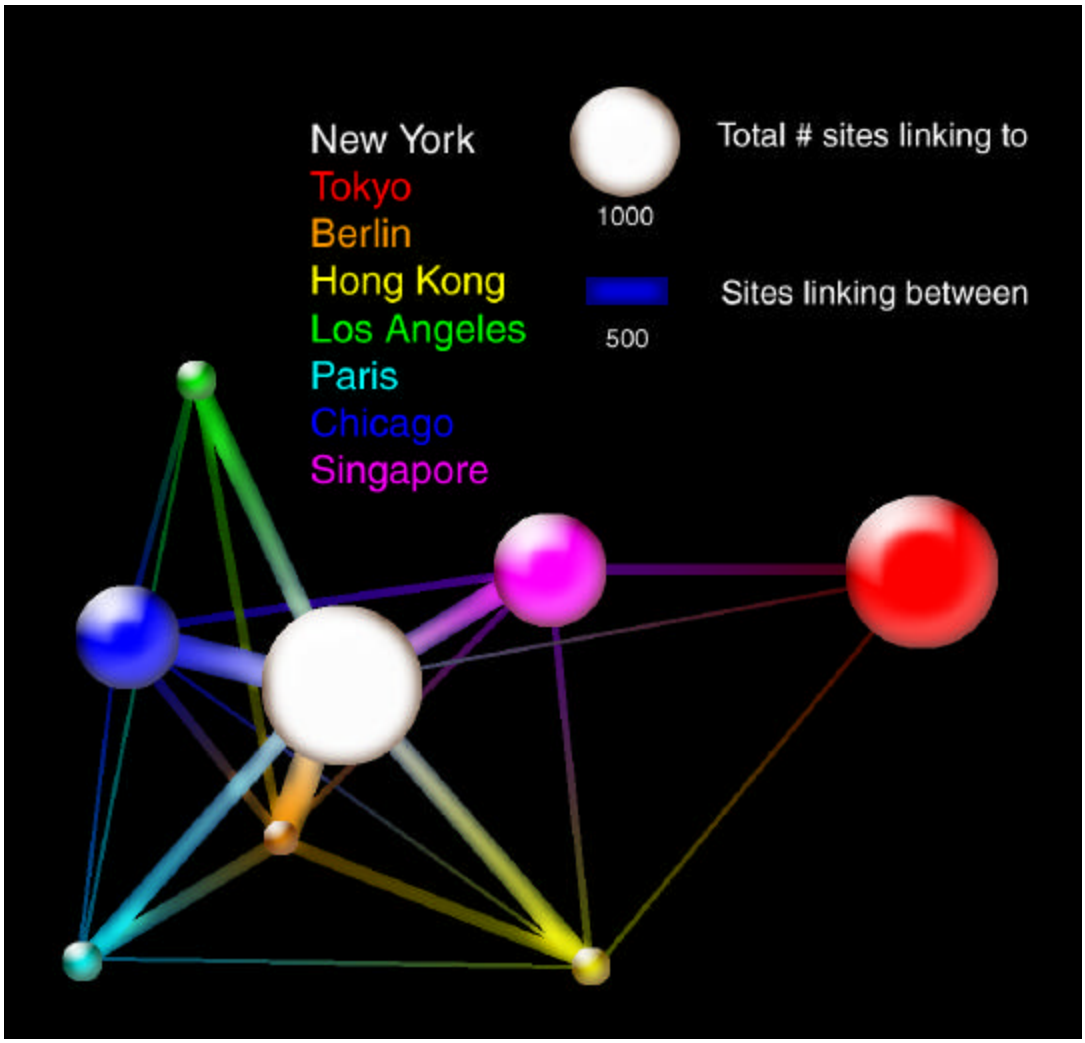

Figure 5-2 – Web linkages between eight global cities (Halavais, 1999).

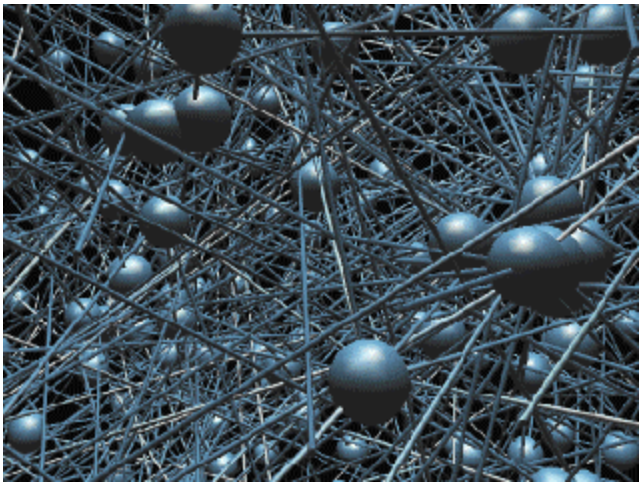

Figure 5-3 – Bonds of friendship among 450 people in Canberra, Australia, created by View_Net II. See Klovdahl (1989).

Especially once these graphs reach a significant size, they cease to be intuitive. This is why many feel that visualization of larger web spaces is not useful. Brewster Kahle, whose Alexa project attempts to archive a significant portion of the web, says that "anytime [sic] data comes in this large, graphics usually fail you. The information is just too complex to represent in an image" (quoted in Johnson, 1999). Programmers often ridicule the three-dimensional depictions of cyberspace in films like *Hackers* and *Johnny Mnemonic* (e.g., fig. 5-5). Because they are meant to represent something familiar to the audience, they are often anchored to landscapes that are common to many people's experience. In both of these films, for example, there was some indication of a virtual cityscape. This idea of cyberspaces has been popular in science

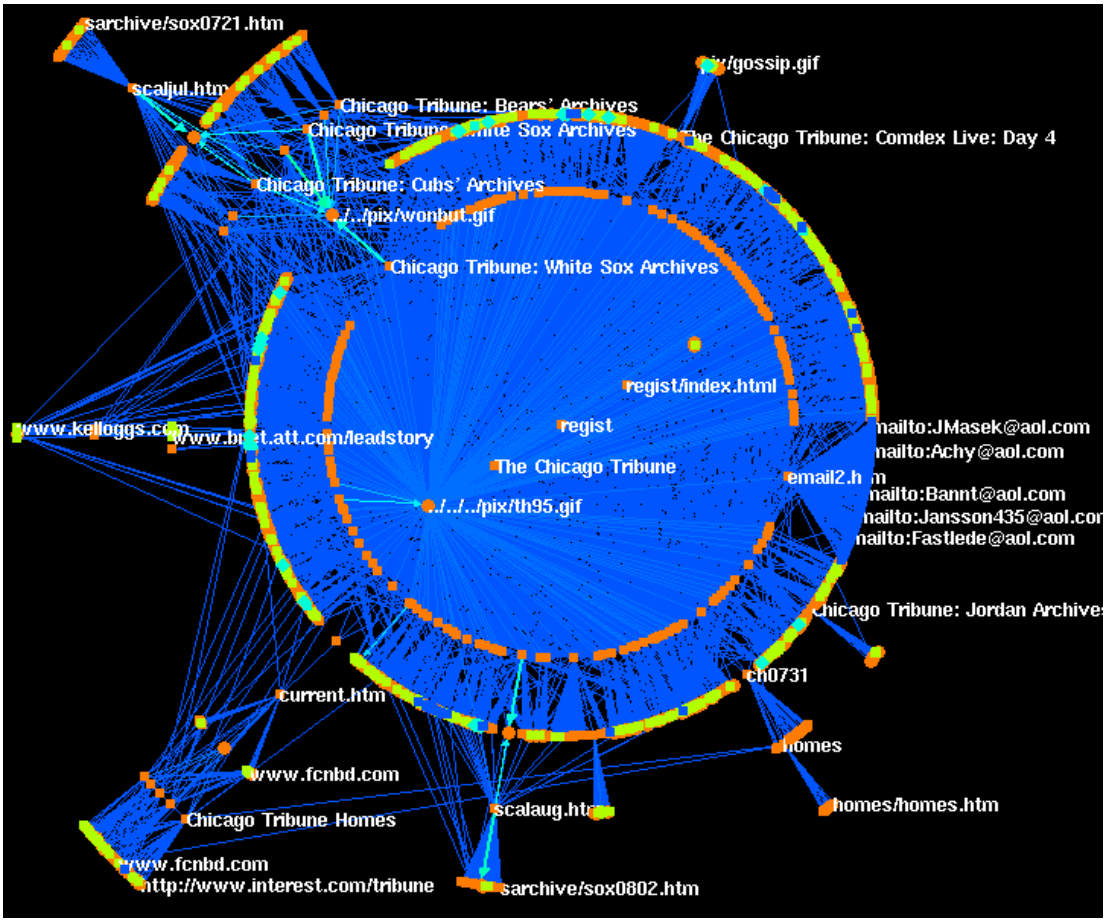

Figure 5-4 – Large scale point and line analysis of web structure using NicheWorks (Wills, 1999).

fiction and, as the quotation that begins this chapter suggests, among those who work with computer networks as well.

There are good reasons to create visual depictions that are not especially intuitive. For many of those who study visualization, the aim is to present as much multivariate data as possible in as small a space as possible, a view that is perhaps best

expressed by Edward Tufte's admonition that "graphical excellence is that which gives to the viewer the greatest number of ideas in the shortest time with the least ink in the smallest space" (1983, p.51). This view is in stark contrast with the development

Figure 5-5 – Cyberspace, from the motion picture Hackers.

of graphic design, and especially the architectural influence of Bauhaus and a recognition that space (and particularly white space) helps to structure and make the whole document clearer. The ideal, we might suspect, is somewhere between those two views.

Tufte's view allows little for the role of experience in perceiving. Indeed, the structuring systems of knowledge we already have absorbed have a significant impact on how we perceive and know of the world (Gibson, 1979). It was for this reason that Alan Kay and others at Xerox PARC designed the first graphical user interfaces (GUIs) for children rather than adults (Hiltzik, 1999). They felt that children would provide them with the necessary elemental interactions, and that successfully creating an interface "even a child" could use would yield an interface anyone could approach. This was not a process of "dumbing down" the computer. On the contrary, it was a way of making the interface more intuitive and attempting to make it as invisible as possible. Few would argue that the images above represent an intuitive view of web space.

Equally important for the larger context of the democratic use of technology, abstractions of web space tend to exclude the casual user, and such systems and their use remain the purview of the privileged scientist. Dennis Chao (2001), who has created a Unix system shell based on the game Doom, suggests that this ties into questions of low and high culture, and that many interfaces drive a wedge between administrators and users[3]. While the failure of interfaces like Microsoft's Bob have retarded the development of concrete metaphors, UBUBU[4] and other game-like

[3] Ironically, though clearly intended as a clever diversion, the project has generated a great deal of attention by those both amused and intrigued. The work is important almost in spite of itself.
[4] *http://www.ububu.com*

interfaces are springing up, along with an increasing recognition of what games can offer the interface design community (Cherny, Clanton, & Ostrom, 1997).

Landscapes

Bray (1996), who, as noted in the previous chapter, did some of the first descriptive work based on web crawling, also made an effort to visualize large parts of that space. Figure 5-6 provides an example of one of the images he created with this in mind. Although details regarding how the maps were formed is sparse, their arrangement is based on linkage structures, and the taller sites receive a greater number of links, while those with the largest spheres floating overhead are the most "luminous" (in Bray's terms) and link most widely to other sites. This helps to explain the large sphere floating over Yahoo, for example. Colors indicate educational, corporate, and government sites.

The idea of a topographic approach to cognitive or topical space has come into vogue as of late. WebMap (http://www.webmap.com), for example places a map of the open directory project's sites on a zoomable map that appears to be topographical, though it seems that the contour lines are little more than decoration. The approach, no doubt, was drawn from ThemeScape, a system that makes use of self-organizing maps (SOM) to cluster topical information. A topographical map (see fig. 5-7, Wise et al,

1997), indicates where topics cluster most densely. Kohonen maps (i.e., SOM), use a neural network to overcome some of the scaling difficulties with other methods of

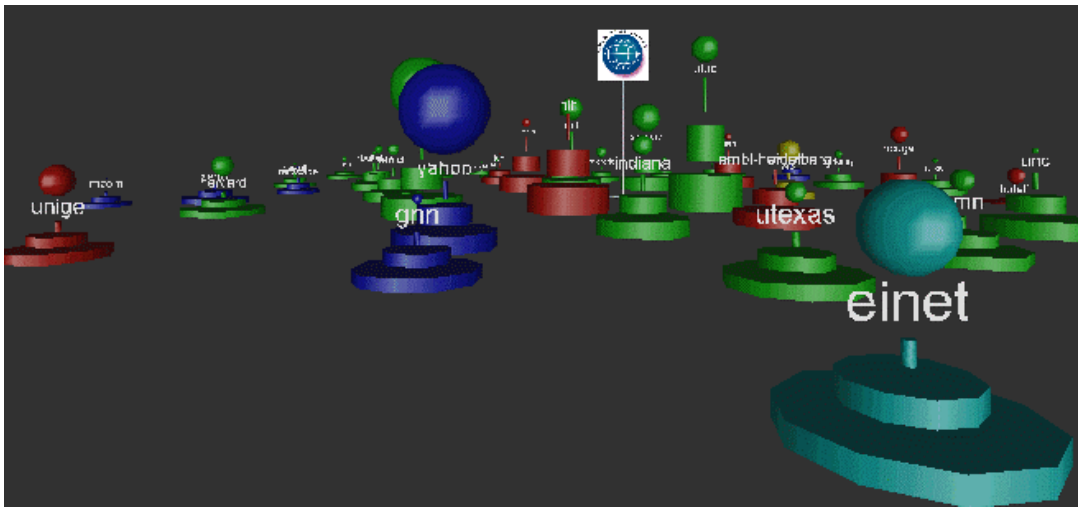

Figure 5-6 – An early web landscape (Bray, 1996).

determining clustering in very large systems (Kohonen, 1990; Lin, 1997). Though originally this was displayed as a set of blocks for each topical area, a more recent version produces maps very much like those of ThemeScape (see fig. 5-8). The SOM approach has been successful at allowing for information extraction from the astronomy literature (Poinçot, Lesteven, & Murtagh, 2000), and recently used to categorize documents on the web (Honkela et al, 1998). While these systems provide a top-down overview of the clustered data, with color marking depressions and peaks of clustering, Fabrikant has worked to display this information in a more obviously landscaped form, citing the possibility that a more familiar landscape view would

provide an intuitive interface for very large textual spaces (2000). Figure 5-9 shows an early prototype of such a browser.

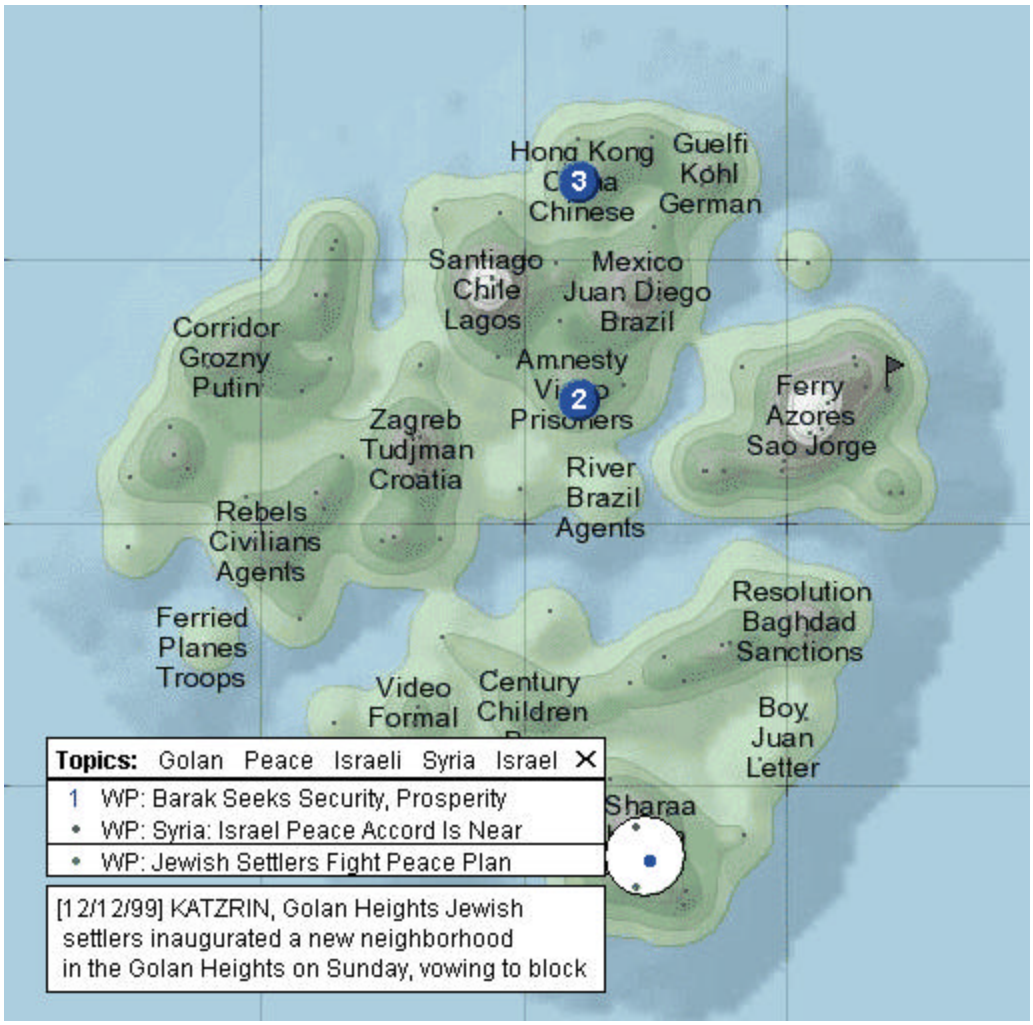

Figure 5-7 – NewsMaps, making use of ThemeScape.

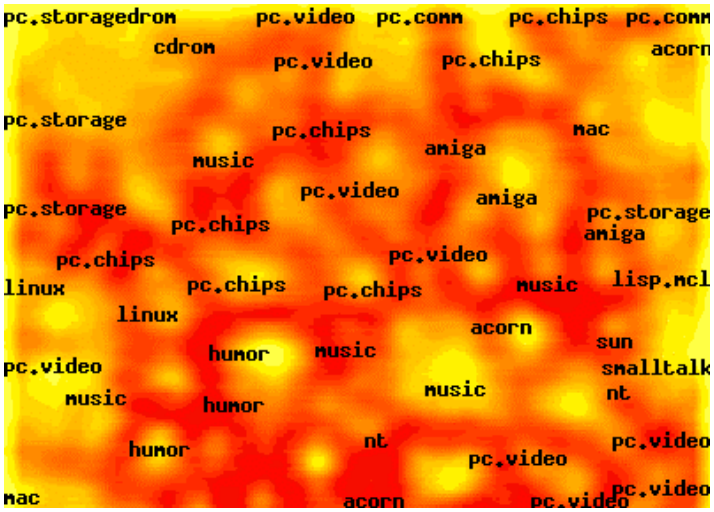

*Figure 5-8 – Portion of WEBSOM map (*http://websom.hut.fi/websom/*).*

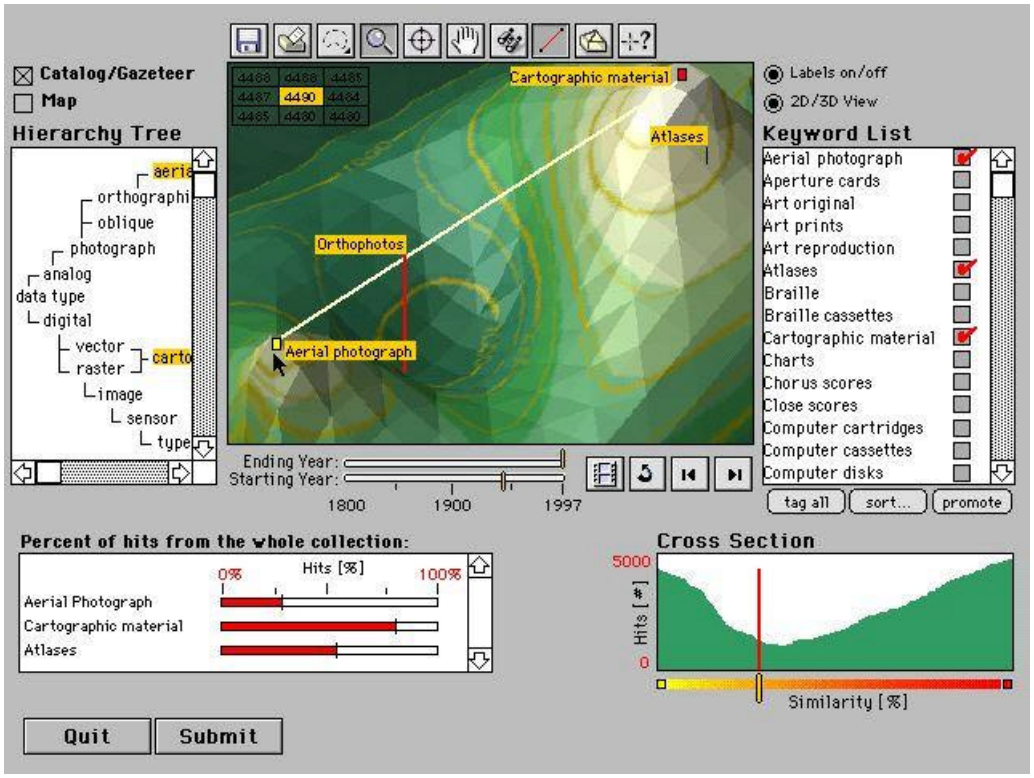

Figure 5-9 – Topics as rendered landscape (Fabrikant, 2000).

There are at least two advantages to treating web space as landscape. The first of these is that if the metaphor is correctly mapped, a better overall picture of the relationships inherent to the network may be revealed. The second is that we can make use of existing GIS (Geographical Information System) and visualization software. GIS has advanced considerably over the last few years, breathing new life into geography departments. GIS has already made inroads in development projects and business[5]. Such systems include commercially available software and a growing number of open source systems. The sorts of relationships and information discovery that make up geographic analysis—relationships between the individual and structural elements—are ideal for analyzing spacialized conceptions of the web (Mitchell, 1999). It makes sense to leverage these already-existing systems to provide some visual feeling for the space the surrounds Slashdot.

Mapping the Slashdot Hyperlink Region

The above attempts at mapping the landscape of the web, with the exception of Bray's map, ignore the most obvious and arguably most useful data. They map the relationship between topics, which involves some significant issues of representation, while most often ignoring the connective structure of the web itself: the hyperlinks. Certainly, the content of the web sites is important, but it is a mistake to ignore the

[5] Both for similar reasons: the adoption of GIS is often a determinant in the distribution of resources. Cartography has traditionally been a closely held tool of the élite. Computerization offers the opportunity for collective geographic information creation and distribution.

emergent space generated collectively by the website authors. An attempt is made here to make a useful map of the hyperlink structure surrounding the Slashdot domain.

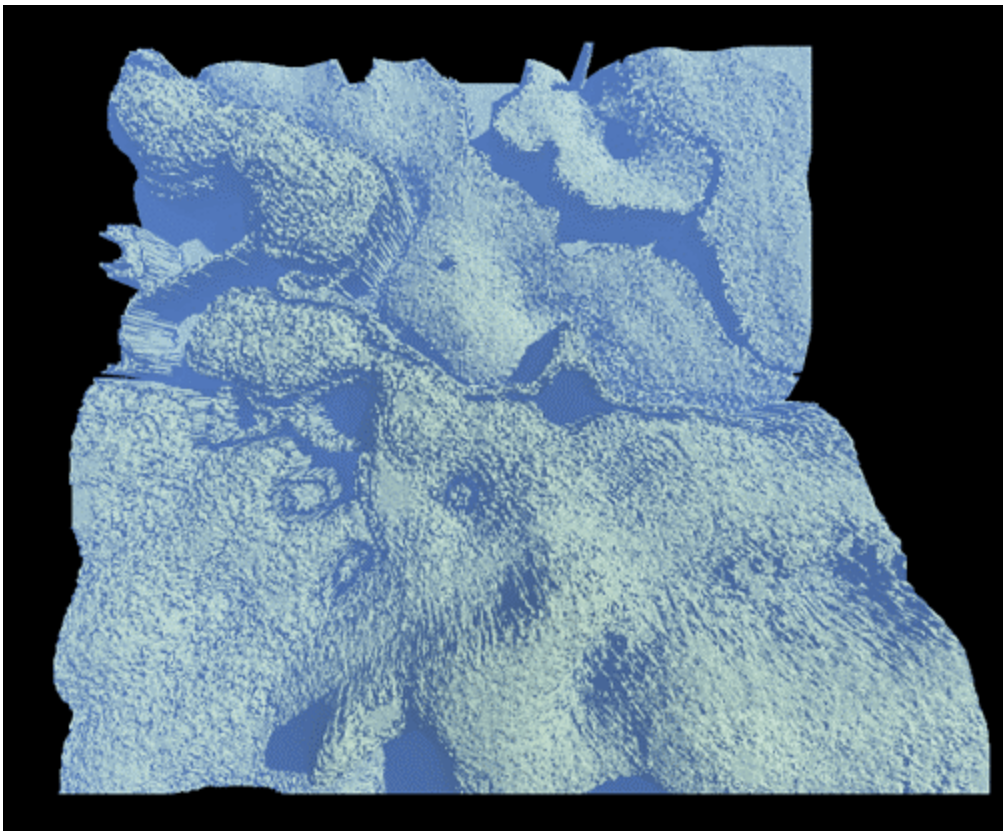

Figure 5-10 – Overhead rendering of Slashdot region.

Once again, the problem of scale is encountered. The traditional MDS, while possible, would require too much processing to be effective. The SOM method has also been used on very large samples with good results. However, again this approach is stymied by the lack of available computing power. By using the data clustered in the

previous chapter into 3000 points, and running the leaf data from that clustered matrix through a self-organizing map, we are able to approximate the large terrain of the hyperlinked space[6]. The generated density display is used as a heightfield map for a rendering system called Terragen.

Figure 5-10 shows an overhead rendering of the region surrounding Slashdot (but not including Slashdot). Low regions imply less densely interlinked domains, while higher areas represent clusters of highly interconnected sites. Distance between areas are indicative of strength in linking. The plateaus lower right end represent the Open Source Development Network family of sites owned by Andover, including Freshmeat, Newsforge, and others. Nearby sites on the same hills include VALinux, Linux Journal, ThinkGeek, and other Linux and open source related sites. The top right side represents commercial sites that are not highly interconnected, and in some cases are not connected at all. These are separated by a chasm from the sites that suffer most significantly from the Slashdot effect, those that are fairly disconnected until they are highlighted by a Slashdot topic. To the left of this open plain is a complicated area of topical clusters, from anime to the overclocking community. Figures 5-11 and 5-12 provide perspectives on the same landscape. The first is looking from the chasm between the commercial and smaller sites upward toward the tightly clustered open source and Linux plateau. The second looks downward toward the interconnected

[6] Keeping the map tied to its labeled sites is the most difficult part of this process. The SOM toolbox for Matlab is available at *http://www.cis.hut.fi/projects/somtoolbox/*.

topical communities. In the distance, you can see a pillar that represents the closely tied together Amazon properties, and in the foreground, several "sinkholes"—unlinked or underlinked sites surrounded by highly linked neighbors.

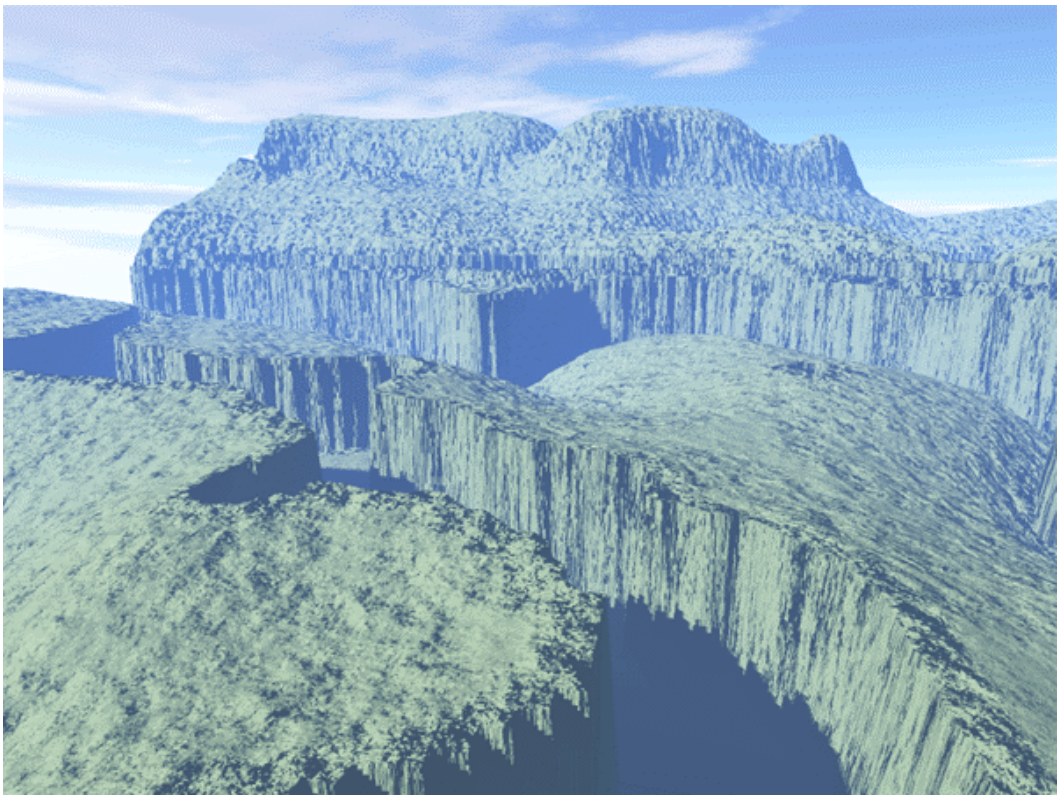

Figure 5-11 – View from the commercial fissure toward the Open Source plateau.

Browsing Information Spaces

This is, of course, only a tentative investigation of terrain representations of hyperlink structure, but it provides a good area for future research. In particular, it is important to see whether individuals can make judgments based upon the representations, and whether they are helpful in more easily finding information. Some

of the early research on the effectiveness of three-dimensional interfaces to the web has been promising (Risden et al, 2000).

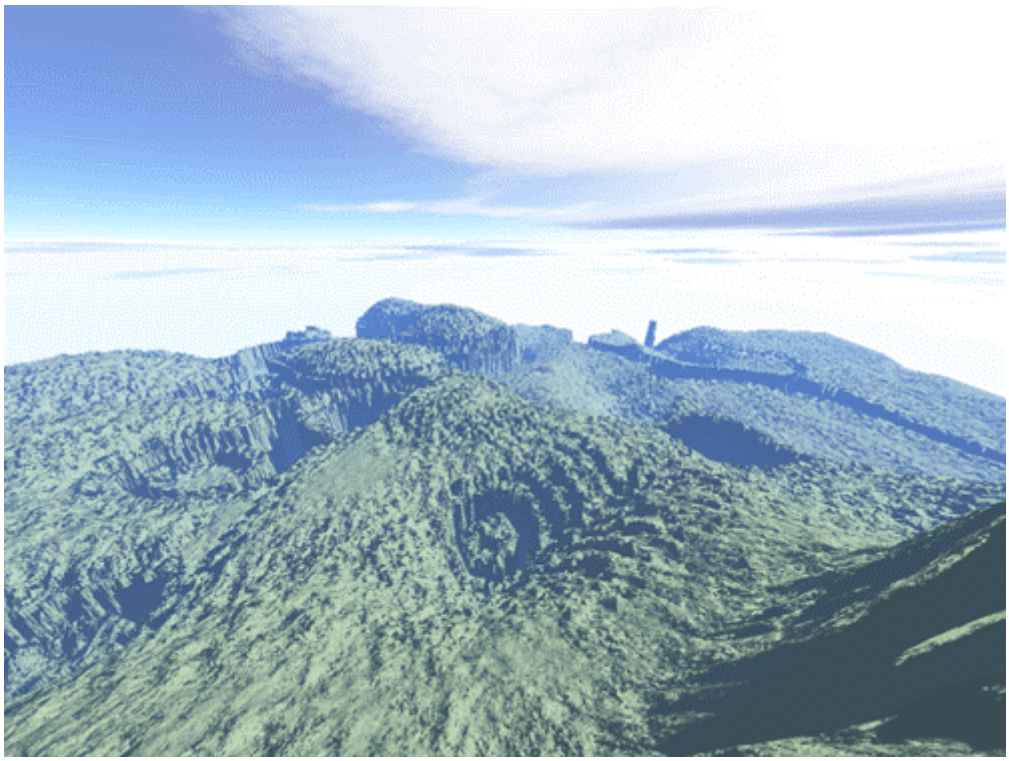

Figure 5-12 – Wide angle view from one end of open source plateau toward various topical maxima.

At present, the process of creating a rendering like the one shown here is tedious. The process itself could certainly be automated, and the viewing process improved. An open source suite of applications called the Virtual Terrain Project[7] allows for interactive exploration of large geographic visualizations. For the terrains to

[7] *http://www.vterrain.org* .

be effective, a clear system of labeling must be in place. By building out the work already done on the VTP Enviro browser, it is possible to create clickable buildings or other markers at the locations of individual sites. Moreover, by using color coding within the terrain to indicate topical areas, the explicit linkage structure of the web can help to inform traditional text searches. Such environments are well suited to collaborative exploration, and would aid in discovering trails left by other users (see Selfridge, 1999). These trails, footpaths created through collaborative filtering, would be the first real implementation of the sharing of information paths envisioned by Vannevar Bush more than fifty years ago[8].

The visualization of the space around Slashdot gives some indication of the collective effects of individual web authors when they begin to link their own pages to others in the web. Far from an open continuous network, one finds that some sites are highly interconnected and separated off from the rest, and others that remain part of the landscape but connect very little to other sites. This linkage of websites is as much a part of the discourse of Slashdot as what occurs inside, though in some ways far more difficult to intuitively understand.

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[8] "Wholly new forms of encyclopedias will appear, ready made with a mesh of associative trails running through them, ready to be dropped into the memex and there amplified. The lawyer has at his touch the associated opinions and decisions of his whole experience, and of the experience of friends and authorities. The patent attorney has on call the millions of issued patents, with familiar trails to every point of his client's interest. The physician, puzzled by a patient's reactions, strikes the trail established in studying an earlier similar case, and runs rapidly through analogous case histories, with side references to the classics for the pertinent anatomy and histology. The chemist, struggling with the synthesis of an organic compound, has all the chemical literature before him in his laboratory, with trails following the analogies of compounds, and side trails to their physical and chemical behavior" (Bush, 1945).

Summary

This chapter has presented some of the challenges of visualizing large network datasets, and has argued for a particular way of presenting such data. By modeling the data as a photorealistic terrain, we benefit from the minds own analytical apparatus. Traditionally, visualization has pushed for abstraction and has urged that nothing but the data be represented in such visualizations. However, such abstractions often require significant cognitive overhead to comprehend. Though these are only the first tentative steps in this direction, the last three figures in this chapter represent an indication of what the region around Slashdot looked like during a single constructed week. Future improvements will include information about content (through shading) and the ability to move through the visualization, as well as clear labels for the sites being mapped.

Being able to see this web region as a whole provides a better understanding of how Slashdot is situated among its neighbors on the web. The following chapter aims to give some indication of how Slashdot allows for interaction with traditional media and how it affects events in the "real world." The image presented here shows Slashdot at the center of a complex web of hyperlinks. This interface with a varied terrain allows it to act as a conduit between various groups. The dissertation aims to

show how Slashdot acts as a technology of consensus and of connection. This chapter, along with the next, provide relatively strong evidence that it does just that.

Chapter 6:
Beyond the Web

> They think the Web should be a free medium of expression and you should be able to do whatever you want. If you defame somebody, fine. If you transfer somebody else's intellectual property, be it music or code or a patent, fine. They want everything to be free and let's all be friends. But fortunately, this is not the American way. The American way is for people to come up with a good idea and try to capitalize on it. ... I think the system we have is wonderful.
>
> – Mark Starr, Unisys patent atty. (in Anderson, 2000)

In the previous chapters, I have attempted to provide an analysis of the Slashdot site: what it is, how it works, and how it might interface with other parts of the web. If not always explicitly, I have in places indicated some possible answers to the most obvious question: Why does Slashdot matter? There are a number of potential answers to this question. It matters because it provides a unique system of reputation-based filtering. It matters because this form of filtering supports a large number of users in a shared public space. It matters because that space can be used to form a more participatory form of democratic involvement. But none of these assertions are viable if Slashdot does not have some influence over changes in policy and society. That influence, if exerted, should be clear both in the way public discourse evolves, and in the ways policy makers adopt the positions recommended by Slashdot.

In this chapter, a central hacker value—the open exchange of information—is placed in a larger social context. In the past, it is clear that organizations like the Electronic Frontier Foundation (EFF) have worked within policy and legal circles and with the larger public to raise issues of free speech and privacy on the internet, as well as advocating the ideals of the hacker community[1]. The attention the EFF brought to bear upon the Communications Decency Act, for example, was instrumental in its being struck down by the courts. This form of hacker activism runs against the common view of the computer nerd as apolitical and unimpassioned. In the following sections we look at two interrelated issues that run against this view of open exchange: software patents (with a focus on Amazon's "one-click" patent) and encryption controls (with a focus on the DeCSS program). In both cases, the ethic of sharing information was pitted against prevailing changes in law and policy. By exploring the ways in which this played out in the press and in the courts, we can look for the hand of Slashdot and attempt to see what, if any, role it has played in these policy issues.

Despite Raymond's assertion that hackers should remain uninvolved in larger political and economic issues (since, he claims, this will tend to be divisive and muddy the waters) there are some political issues that are central to the hacker ethic and cannot be cast aside. The question becomes whether hackers have an effective voice in these matters, and what rôle, if any, Slashdot plays in facilitating the publicity of

[1] According to Howard Rheingold (1993), the EFF was founded in large part because of a perceived lack of understanding by the FBI and others who were suddenly expected to be competent in the new technology in order to enforce policy.

information to a larger public and to those who are more directly involved in crafting and determining policy. The chapter begins with an overview of the two cases, and then moves on to examine the differences between coverage in the mainstream press and on Slashdot. Based on this, we reach some conclusions about what the effects of Slashdot and the Hacker community might be, and how these effects might extend into other, related domains.

Software Patents and Amazon's "One-Click" Process

As noted in the opening chapters of this work, the open source movement is a permutation of the free software movement, which was, in turn, founded as a way to resist the encroaching control of corporations over the creation and modification of computer software. An early rift occurred between the hobbyists who assembled the first personal computers and a young Bill Gates. Gates was incensed when he discovered that early versions of the BASIC interpreter he had helped write were being traded for free (and sometimes for a profit) rather than being purchased from his company (Levy, 1984). The battle continued to rage between those who saw corporate control over software rights as unfair and the those in corporations who argued that without strong control over software as intellectual property, there would be no innovation in the software market[2].

[2] Although not intended as a refutation of this position, Jaron Lanier argues in his "Tale of Two Terrors" (2000) that software has not progressed in the last few decades, and that in some ways it has

One of the key issues in this battle is that of software patents. Software, as a written and, at least potentially, an "embodied" work can enjoy the protection of copyright. Copyright, however, does not protect the *ideas* of a work, only the embodiment of the work itself. Although this can be stretched somewhat (boat hulls and architecture can be copyrighted, for example), copyright cannot be used to protect the process or organization of a program. Someone can create a new version of your program, as long as it does not make use of the original source code, which is protected. There have also been attempts to copyright the "look and feel" of a work. The most famous of these was the Lotus 1-2-3 suit, and it has been followed by a number of others, including Adobe's recent suit against Macromedia. Since a "look" could be protected by copyright in traditional works (the design of a newspaper front page, for example), the argument was that a graphical user interface (GUI) should receive the same level of protection. This remains an area of contention[3].

Far more problematic is the introduction of software patents. As noted above, software was originally seen as the embodiment of a certain range of facts. While you can copyright a book on linear algebra, you cannot copyright (or patent) linear algebra, even if you are the first to develop a novel proof. You can, however patent

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regressed; that a word processor is now an enormous and poorly designed piece of software, while the increase in size and scope has added little in the way of value.

[3] The Lotus suits were also the first documented occurrence of hackers demonstrating against such extensions of intellectual property. Branscomb (1994, pp.138-9) describes a picket by Marvin Minsky and Richard Stallman, during which they chanted "Put your lawyers in their place, no one owns the interface." A spokesperson for Lotus called the demonstration "silly," and said that it ignored the realities of the marketplace.

"processes." If you have discovered a new way of creating peanut butter and jelly sandwiches, you may patent this process (as J.M. Smucker Co. has done; US Patent 6,004,596). In fact, this process can exist without actually producing something. For example, if you discover that shining a laser pointer at the wall and shaking it amuses your cat, you may patent this idea (US Patent 5,443,036).

As of a 1981 Supreme Court decision (*Diamond v. Diehr*[4]), software was able to be patented as a process. Unfortunately, it has never been clear how to determine whether a piece of software is truly an original process. Early patents included one that covered most forms of "multi-media" and the use of advertising in software. Both patents were, in an unusual move, overturned after Bruce Lehman, who headed up the patent office, had them re-evaluated (Miller, 1996, p.369). There are many other examples of seemingly nonsensical patents. Last year, for example, British Telecommunications discovered in a "routine check" of their over 15,000 patents that they had patented the hyperlink in 1976. They have subsequently requested that US ISPs pay a licensing fee for their use (Rohde, 2000).

Other patents, like Unisys's patent for the process of creating GIF encoded graphics, the most popular graphic format on the internet, are now beginning to be enforced as well. As a result, many of those who find themselves opposed to software patents have encouraged people to switch to an open system, PNG, for encoding their

[4] The case, incidentally, dealt with the curing of synthetic rubber, and not computer programs. However, in recognizing that process often implied a mathematical understanding, the door was opened to patenting algorithms. 450 U.S. 175.

images on the web. The "Burn All GIFs Day" in late 1999, according to Charles Mann, "may [have been] the first time in human history that anyone has ever thought it worthwhile to stage an organized political protest, even a small one, over a mathematical algorithm" (1999; also *http://burnallgifs.org*). The Unisys patent on the GIF format points to the larger problem with software patents. Even those patents that do consist of a narrowly tailored, unobvious advancement of the state of the art serve to inhibit innovation, or so argues the "League for Programming Freedom"[5]. This is an especially important issue for the open source community, which could be crippled if the process of software patenting is continued. While large corporations often make strategic agreements allowing partners to make use of one another's patent rights, the creator of free software must increasingly navigate a minefield of potentially patented software and formats.

Although patents on what many consider to be obvious approaches continue to be reported[6], the two that have shared much of the spotlight are Priceline's patent on the reverse auction, and Amazon's "one-click shopping" use of cookies on the web[7]. Both seem to many to be "obvious" uses of computing technology, and therefore undeserving of patent protection. Amazon has garnered most of the attention, though,

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[5] *http://lpf.ai.mit.edu/*

[6] Recently, for example, a company (Pumatech) was awarded a patent on the use of a checksum (the "sum" of the text expressed as a number) to detect whether a web page has changed. This basic application of programming technique may now be protected by law—and will, for example, force me to use a much less efficient method of detecting changed web pages on another research project.

[7] The former was enabled in part by a further widening of what is considered a process to include "business processes" (State Street Bank & Trust Co. vs. Signature Financial Group Inc., 525 U.S. 1093, 1999)

by aggressively pursuing their patent rights, especially against their rival, Barnes & Noble[8]. A suit, due to be heard later this year, alleges that the company produced a "copy cat" version of Amazon's cookie-driven shopping cart. Critics saw this broad patent as an obvious indicator of the danger of software patents generally. Richard Stallman wrote an essay that appeared in *Linux Today* (1999) and encouraged a boycott of Amazon. On the other hand, Apple Computers licensed the technology from Amazon, adding some weight to the idea that Amazon actually owns the process. The Amazon patent was followed by a second patent, in February of 2000, on the use of affiliate systems. Affiliate systems allow an individual or company to set up links to Amazon, and to receive a fee for referral. Again, many complained that this was an obvious application of the technology and undeserving of a patent.

Many see the Amazon patent as indicative of software patents generally. While many thousand patents have already been granted, the court's decision on the Amazon case will have long-lasting effects on the software industry and on open source. Just as software is increasingly considered intellectual property, laws protecting that property have become stricter. A bookseller patenting a web-based shopping system and movie companies maintaining their copyright protection on DVDs may not immediately seem related. Both however, revolve around who is allowed to create programs that perform specific tasks. In both cases, large corporations are insisting that the

[8] See *http://noamazon.com.*

government protect them from “pirates”: those who would make use of their intellectual property without paying the necessary fees.

Encryption, the DMCA, and DeCSS

Encryption remained, for some time, an interesting, if marginal, area of computing that was mainly of interest to programmers who worked in military and intelligence communications and a small number of mathematicians working in universities. With the advent of internetworking, cryptography suddenly came to be of interest to a much larger group. While the fight against the Communications Decency Act (CDA) was among the most publicly recognized battles over information policy, there had been ongoing skirmishes for years over US export policy and key escrow. Encryption systems were classified as “munitions” by the US government, and even today technologically advanced cryptographic systems may not be sold overseas. Though the restrictions have been relaxed somewhat, you still may not include strong encryption in, for example, web browsers that are downloaded from servers inside the US to clients outside the US. Much of this early battle involved a program called PGP (Pretty Good Privacy) that allowed individuals to quickly and effectively encrypt email and other files in such a way that they could not be easily cracked by the government or others without a key. The code to implement public key cryptography could be very short, and many American programmers wore t-shirts with the code on

them when traveling overseas as a protest against US policy. The fight entered the courts when professors at several US universities were charged with crimes for publishing books with encryption algorithms detailed within. The courts were faced with the difficult problem of separating the communication of "ideas" from the communication of a process—only the former was said to enjoy strong First Amendment protection (Post, 2000).

During the same period, the US government tried to find a system that would protect individuals' privacy while still ensuring that the government could gain access to the information if necessary. The proposed solution was called "key escrow" and mandated that all encrypted messages have two keys made for decryption, one for the owner and another that would be held by a "trusted party." This trusted party would then provide the key to the government if a subpoena was issued. With continued significant resistance from the software industry, as well as from privacy advocates, this proposal finally was done away with.

A more recent case involves an interesting intersection between encryption and copyright[9]. DeCSS is a small program that allows a user to override the copy protection system employed by most commercial digital versatile disk (DVD) producers. The name of the program refers to its ability to decrypt the most common form of DVD copy protection, the Content Scrambling System. In addition to ensuring

[9] The following discussion on DeCSS is based on an abbreviated version of Halavais (forthcoming).

DVDs cannot be copied, CSS provides other restrictions on use, including regional controls and required viewing of previews on some DVDs. DeCSS has become a test case for the application of new copyright law to multimedia, and a rallying point for those concerned with the "fair use" of copyrighted material.

CSS uses a system of encryption that requires a DVD player to provide a 40-bit key to temporarily decrypt and display the video. This key is provided by the hardware itself in the case of a stand-alone DVD player or by software that displays the video on a computer screen. In the latter case, the required software and keys are licensed to makers of commercial software by a trade group called the DVD Copy Control Association (DVD-CCA). A number of DVD players have been made available for computers, including WinDVD, ATI DVD, XingDVD, and many others.

Several groups attempted to "reverse-engineer" the CSS system soon after its introduction and discover its encryption process. Although it is not entirely clear who was the first, as many as three groups managed to successfully uncover the workings of CSS. The process was made far easier when the makers of one such program, XingDVD, failed to adequately protect their key. As part of a larger project to provide video playback for the Linux operating system (the "Livid" project), a group of young Norwegian programmers led by sixteen-year-old Jon Johansen, used this information to write DeCSS. DeCSS would allow those using the Linux operating system to view

legally purchased DVDs, and (either coincidentally or centrally, depending upon your perspective) put no barriers on copying these DVDs.

At the end of October 1999, Johansen placed a copy of DeCSS on his father's web site. Soon after, the program had spread over much of the web. Though it was argued that DeCSS was part of a multimedia system for the Linux operating system, this program, in fact, ran on Windows. Other portions of the system would have to be implemented before it could be used on Linux systems directly. Attorneys for the DVD-CCA demanded the program be taken down, and at the end of January of 2000, Johansen and his father were detained and interrogated, and computers and cellular phones were seized from their home. The coverage of this event set the stage for court battles over the following years.

This was neither the only nor the first software available that allowed either the copying of DVDs or "ripping" of their content. Several tools were already available that could do this, including those that allowed the creation of an exact bitwise copy of a DVD. DeCSS was exceptional because it overcame the CSS system to access the contents of a disk. Under the provisions of the 1998 Digital Millennium Copyright Act (DMCA), it is illegal to distribute technology used to "circumvent a technological measure that effectively controls access to a work." As such, the reverse-engineering of the system and creation of a tool that evaded the CSS licensing scheme was, to use

the metaphor provided by the DMCA, the equivalent of creating a method of gaining entry to a locked building.

In November 1999, the DVD-CCA, joined by the Motion Picture Association of America (MPAA), brought action against dozens of individuals and organizations who had posted the DeCSS code or who had linked to it in separate cases in California, New York, and Connecticut. Among the defendants were *2600: The Hacker Quarterly*, a magazine dedicated to cracking computer systems, and Slashdot. In the New York case (*Universal v. Reimerdes*) and the Connecticut case, the MPAA argued that DeCSS violated the DMCA, while the California case argued that the defendants stole trade secrets owned by the DVD-CCA. A preliminary injunction was issued in the cases, and those named as defendants were forced to take down any copies of DeCSS. Though *2600* refrained from providing the program directly, as required by the injunction, they provided links to hundreds of other sites from which DeCSS could be downloaded, and encouraged readers "all throughout the world" to "take a stand and mirror these files."

In the New York case, and the Connecticut case that eventually joined it, defendants presented two arguments. First, they claimed that CSS impeded their "fair use" of the digital videos they had purchased. Early on, copyright law in the United States recognized that while copyright may protect innovation by protecting the rights of authors, there are times when the public good requires that copyrighted materials

may be copied and used. For example, a scholar may want to quote the work of another to illustrate an idea or to criticize that work, or those who have purchased music albums might want to create a tape compilation of music for their own use. The defendants argued that DeCSS was not particularly effective against piracy, but did enable the use of DVDs in a way that did not infringe upon the movie studios' copyrights. Judge Lewis Kaplan dismissed this argument, suggesting that the balance between protecting against piracy and restricting fair use had already been struck by the Congress in creating the DMCA, and that there was "no serious question" that DeCSS violated the DMCA.

The second argument in favor of the distribution of DeCSS was that it was not a "device," but rather a fragment of speech, and deserved the full protection of the First Amendment. Kaplan recognized that code could be expressive, but that it was not purely expressive "any more than the assassination of a political figure is purely a political statement." Kaplan indicated that anything less than "pure speech" was at best partially protected by the First Amendment. Earlier court cases related to the dissemination of encryption code had established that computer code was a form of speech, and that source code deserved some protection as such. This was, in effect, a major step backwards in terms of constitutional protection for "free software."

By July of 2000 both the New York and California cases had been decided in favor of the motion picture industry, much to the consternation of the Electronic

Frontiers Foundation, which continued to provide legal defense for those involved. Especially surprising was the decision that not only were the sites prohibited from providing DeCSS, defendants could not provide hyperlinks to any such site. Hyperlinks were found by Kaplan to be a form of "trafficking" in illegal goods, and therefore illegal according to the DMCA. Given the importance of hyperlinks to the structure of the World Wide Web, such a decision came as a shock to many. At present, the case is going through the appeals process. For now, those who continue to support the distribution of DeCSS have little to worry about in practice. A search on Google for "DeCSS" yields thousands of sites from which it can be downloaded, and links have appeared on sites like Download.com and CNN.com.

The principles argued in the DeCSS case remain at issue and this has spurred an interesting cultural and artistic response. To further press the question of where code ends and expression begins, many have recast the DeCSS code in artistic contexts. The first attempts at this were transcriptions of the DeCSS code onto T-shirts, a tactic used in earlier conflicts over encryption as speech. The organization that produces the T-shirts (copyleft.net) was added to the California law suit. DeCSS has been made into pieces of music, hidden within graphics, cast as a haiku, and been represented as a single prime number that can be decompressed to the DeCSS

program, all of which are available at David Touretzky's "Gallery of CSS Descramblers" web site[10].

It may seem odd that a simple program could have caused, and continues to cause, such a furor. Both sides argue that the legal status of DeCSS has significant repercussions. Those involved in writing "open source" software argue that if DeCSS is found to be illegal, it will have a chilling effect on the software community, stifling creativity and the exchange of ideas. The motion picture industry claims that if DeCSS is widely distributed it will establish a precedent that will make protecting intellectual property impossible, and that as a result the DVD standard will go unused and studios will not release versions of their work in digital form.

Again, the DeCSS suit is emblematic of a series of problems with the DMCA and protection of software as intellectual property generally. The Secure Digital Music Initiative (SDMI)[11] is an effort to find a way to encrypt music so that its distribution can be better controlled. The need for this from the perspective of the recording industry, in the wake of the success of Napster, is both obvious and acute. SDMI developed a system of watermarking that ensured that music could only be played in approved devices. Recognizing the need to test the security of such a system before rolling it out (something that had not occurred in the case of CSS), SDMI posted an

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[10] *http:// www.cs.cmu.edu/~dst/DeCSS/Gallery/index.html*
[11] *http://www.sdmi.org*

"Open Letter to the Digital Community,"[12] in which it challenged any comers to break the SDMI watermark / encryption system, and offered fame and a cash prize of $10,000. One of those who took them up on the challenge was a Princeton professor of computer science by the name of Edward Felten. Felton prepared an academic paper for delivery at the Information Hiding Workshop, where it was accepted after peer-review. SDMI threatened to sue Felton, once again under the provisions of the DMCA, and so the paper was withdrawn from the conference.

Comparison of Coverage: The Amazon Patents

Each of these cases received a fair amount of news coverage in the popular press, and much more extensive coverage in enthusiast and professional journals and web sites. Widely read newspapers play an important function both in informing public opinion and in setting the agenda for public debate (McCombs & Shaw, 1972). The stakes are high. Although popular opinion is not the only element needed to change policy, it remains an important one. Jessica Litman (1997) argues that copyright law tends to favor the "copyright industry"—publishers and the intellectual property attorneys that represent them. The only way this can be countered is with a larger public awareness of what is at stake, and public pressure on legislators to be proactive. It is for this reason valuable to discover the degree to which reports in the

[12] *http://www.sdmi.org/pr/OL_Sept_6_2000.htm*

newspaper are related (or at least correlated) to discussions that occur within the community most critical of the growth of intellectual property law in software and information technology, a community that calls Slashdot home.

Let us begin with an assertion made by Robin Miller, a Slashdot editor, at the end of 1999[13]:

> Fast-forward to now: there are days when Slashdot does well over one million pageviews. Reporters from The Wall Street Journal (Hi Lee!), CNN (Hi, Ian!) and even Al Gore campaign staffers (Hi, Ben!), read Slashdot regularly. Stories that break here are often picked up by general-interest media or serve as inspiration (we say politely) for their own reporting. And Slashdot readers obviously subscribe to discussions like debian-legal, so the distance between a hasty mailing list post and the front page of a national newspaper can be as little as two clicks.

This is a widely held claim, and one that is often debated within the responses to Slashdot. Jaded contributors will write "this is news?" and complain that they knew about a news item hours or weeks ago and were really the first to submit it to Slashdot. Yet there seems to be an overall belief that the mainstream press, when they "get it," get it from Slashdot. We can examine some of the news coverage on both the Amazon.com patents and DeCSS issues to try to reveal the relationship between Slashdot and the popular press. In doing so, we can detect where the story first broke, the way the story was treated and what perspectives were first presented, and how these perspectives might have changed in either venue over time.

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[13] *http://slashdot.org/features/99/11/28/1113233.shtml*

We begin by looking at the earliest reports on each topic, when and where they appeared, and what perspectives were presented. Amazon's one-click patent first makes news when the patent is awarded, in an article in the *Wall Street Journal* on 13 October 1999[14]. Slashdot also covers the story, based on (apparently) the same news release by Amazon. They also include a link to a copy of the patent[15]:

> **Posted by Hemos on Tuesday October 12, @11:04PM EDT**
> **from the attack-of-the-dumb-patents dept.**
> jaydeekay writes *"It looks like Amazon has patented the storing of credit-card and shipping info and then using it to facilate* [sic] *online purchasing via a single click. Check out this news release from Yahoo. Interesting to look at the actual patent - Amazon seems to have several patents which seem awfully 'generic' "* Ah, yes, yet more dumb patents.

Much of the debate centered around whether the patent was "obvious" or not. Many of the comments reacted to the news with opinions, no doubt triggered in part by the editorial tag by Jeff Bates (Hemos), about how this fit into the general trend of bad software patents issued by the patent office. There were exceptions of course. A computer science undergraduate student came to the defense of Amazon, claiming that the patent represented a significant improvement, but the vast majority of commentators saw the patent as an unwelcome surprise. Many linked this patent to earlier software patents. One author posted a mini-essay that concluded:

> Such oppression is out of place for the otherwise free and democratic ideals the Net so powerfully engenders, and particularly out of line with regards to the separation of powers between the governmental structures. We need reform. Complaining about patents on a technical

[14] This and other examples are based upon searches in the Lexis-Nexis "General News" database.
[15] *http://slashdot.org/articles/99/10/12/1826242.shtml*

> level is effective, but needs to be prefaced by an explanation of not only *how* such patents are ludicrous and valueless, but *why*. Your livelyhood [sic] could be next. Call your congressman.

On 22 October, the *Chicago Sun-Times* ran a short item noting that Amazon was suing Barnes & Noble for patent infringement, and included a brief comment from a spokesperson for the defendant in which he indicates that they have not yet "had time to examine the suit." The *Seattle Times* ran a slightly longer piece, quoting Amazon president Jeff Bezos at length from a press report. CNNfn.com also carried a longer story (with a shortened version of the Bezos quote), looking at the economic impacts this might have on Barnes & Noble, as well as questioning the likelihood that the patent would stand up given a similar patent recently issued to Microsoft (for their "Passport"). The stories in the days that followed, including a longer feature by the *New York Times*, mostly relied upon business analysts as sources when they went beyond the press releases at all. Many were (as noted in a summary of media coverage in an article in the *Industry Standard* on 25 October), mildly dismissive of the suit. However, compared with the discussion of the reasons for the patent and the suit, and the effect they would have on business, there is very little criticism of the viability of the patent itself. This is in contrast with the discussion on Slashdot, which tended to focus on the viability of the patent and of software patents generally. With few exceptions, in none of these news reports was the patent held as indicative of a larger overall trend.

The exceptions here began with a story in the *Financial Times* (US edition) on 25 October, which not only drew the patent into the context of process and software patents generally, but quoted Tim Berners-Lee, the inventor of the web, questioning whether any new technology had been patented, and suggesting it was a little like "patenting going shopping in a yellow car on a Thursday"[16]. This comment was repeated in a BBC report the same day, in an even more critical article that suggested that the struggle over software patents could "change forever the entrepreneurial spirit that characterizes the web"[17]. Indeed, over the next several weeks, the *Financial Times* continued to publish articles that set the Amazon patent within the larger context of intellectual property in the software business generally.

Slashdot linked to the CNNfn story of 22 October. The discussion once again revolved around the question of whether the patent was viable, and the degree to which it exemplified problems with software patents generally. Several of the posters suggested that they had designed or were administering systems that were likely to infringe on the new patent. One participant posted his letter to Amazon, protesting their suit and asking that his name be removed from their database. He then posted the form letter with which they replied (blocking out the name of the customer service representative). Later posters did the same. One participant suggested that they track and compare letters they get back to see whether there was any pattern, or if particular

[16] Berners-Lee was likely easily reachable, given that he was on a book tour and doing many interviews already.
[17] *http://www.felixent.force9.co.uk/hnc/ama.htm*

themes elicited different responses. Someone who had knowledge of Amazon's customer service department suggested that while individual letters would be ignored, the content in general might be relayed to someone of importance. Given that Slashdot-organized letter-writing campaigns had met with moderate success in the past[18], it was hoped that this might influence Amazon's decisions as well.

Both the topic on the 12th and the one the 22nd saw a large number of calls for a boycott. No postings objected, and there was a gathering momentum. Several Slashdot readers who worked for a Seattle software company started a site called NoAmazon.com in protest, providing links to other book e-tailers[19]. This was picked up in a feature article on software patents that appeared in the *Seattle Times* on 7 November (Black, 1999). The entire article was fairly critical of software patents generally, linked the suit to another software suit in the news (Priceline was suing Microsoft for patent infringement), and came the closest to the debate on Slashdot. The article included sources from the U.S. Patent Office and patent attorneys from Perkins Coie, the law firm representing Amazon in the suit. Other sources included Gregory Aharonian, an outspoken critic of software patents who had been referenced on several occasions in earlier Slashdot postings.

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[18] According to another Slashdot topic (*http://slashdot.org/articles/99/02/02/2152218.shtml*), a series of letters to Bell Atlantic resulted in their supporting DSL for Apple Macintoshes, for example.

[19] While it is clear that several of those involved—programmers at the Kirkland-based Red Game Tools—were Slashdot readers, it is not possible to track any of the original calls for a boycott back to any of them directly.

It took some time before this theme caught on in other publications. Though papers reported on the preliminary injunction against Barnes & Noble, forbidding them from using their "Express Lane" ordering method, these reports were uniformly limited to the barest facts. At the end of December, the *Wall Street Journal* and the *Seattle Times* (and eventually the *Bangkok Post*) reported on an Amazon boycott announced by Richard Stallman in an article that appeared in *Linux Today* (1999). Slashdot also provided a link to this statement. The comments posted to the topic on Slashdot were supportive, but many of the earlier postings lamented the fact that the discussion of a boycott that had occurred months ago never came to fruition. As one contributor noted:

> Why don't we ever have official, Slashdot-endorsed boycotts that we can all get behind? We always talk about it, but noone [sic] ever does anything *official*. There ought to be a proper /. petition, so we can send them about a gazillion emails showing them who's not going to be buying their books over Christmas.

Others responded by noting that there could be legal issues involved in "sanctioning" a boycott, or by suggesting other ways of affecting Amazon's business. *Wired News* provided a story on the Stallman announcement, and referred specifically to reactions posted on Slashdot (Bicknell, 1999). This *Wired* story was in turn Slashdotted, as are many stories that make mention of Slashdot.

The early effects of the boycott are difficult to gauge, though it certainly did not lead Amazon to drop the suit. By the end of the Christmas season, Amazon had

received more orders than any other on-line retailer, and Bezos had been named "Person of the Year" by *Time Magazine*. Neither the controversy over the "one-click" patent, nor an unrelated trademark suit that had recently been settled[20] was mentioned in the *Time* article. Stallman requested that Tim O'Reilly, president of a large technical publishing group, come out in support of the boycott. While O'Reilly did not directly support the boycott (Amazon.com is the largest retailer of O'Reilly books), he did write an open letter strongly criticizing Amazon for pursuing the patent and the infringement suit. This letter was signed by 10,000 others before the signature system was stopped. Jeff Bezos replied to this letter, and they jointly published an edited "conversation" on the issue[21]. Both O'Reilly and Bezos mentioned the recently-popular *Cluetrain Manifesto* (Locke et al, 2000), which begins with the statement: "Markets are conversations." Both had links to public message boards on which interested parties could post messages, and among the 774 responses published on O'Reilly's site, many are thoughtful, well argued positions. Bezos suggests in his open letter that the entire incident demonstrated how conversations could be opened between corporations and customers.

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[20] In April of 1999, a 30-year-old Minneapolis shop named "Amazon Bookstore" sued Amazon.com for trademark violations. Rather than settling the suit early on, Amazon's attorneys instead based their defense on the sexual orientation of the owners of the older Amazon Bookstore, noting that because they did not market to a "general audience," they constituted a different market than Amazon and that this could not lead to confusion between the two businesses. This approach, which included questioning under oath regarding the sexual orientation of the owners and employees, caused a significant backlash against the company (see Mieszkowski, 1999).

[21] "My Conversation with Jeff Bezos": *http://www.oreilly.com/ask_tim/bezos_0300.html*; Bezos's "open letter": *http://www.amazon.com/exec/obidos/subst/misc/patents.html/002-9536650-8104800*

The results of this "conversation," and of the boycott are difficult to find. Stallman's site includes a letter from someone suggesting that news of the boycott had made its way into reports to stock brokers, and this might have precipitated the fall in Amazon's stock price, but other evidence of this possible connection is non-existent[22]. Despite the conciliatory dialog with Tim O'Reilly, by the end of February Amazon had cemented its approach to software patents by patenting the process of using affiliates, other web sites that would link deep into the Amazon site to sell specific books in return for a finders fee. Newspaper articles in the interim had become increasingly critical of software patents. In the weeks preceding the announcement of the patent on "affiliates," articles over the Associated Press wire and others appearing in the (London) *Daily Telegraph*, *St. Louis Post-Dispatch, Newsday* and the *New York Times* cited critics of software patents and identified a rise in the number of federal disputes over intellectual property. An article in the latter claimed "criticism has been building in the academic world, with many arguing that the growing privatization of knowledge will threaten traditional intellectual and artistic freedoms" (Lewis, 2000). Amazon had come to serve as emblematic of a problem with the patent system, just as it had in the first postings on Slashdot the day the "one-click" patent was announced.

The announcement of the "affiliate" patent was, once again, noted in major newspapers as a very straightforward announcement for the most part. The only early

[22] *http://www.gnu.org/philosophy/amazon-nat.html*

exception was a brief article in *USA Today* entitled "Patent Stirs Web Uproar," which noted the rise of a new boycott effort. Slashdot was relatively silent (perhaps even, as will be noted below, suspiciously silent) on the Amazon front until citing a News.com report on 25 February. Many of the first comments were familiar: incredulity that such a patent could be granted and exasperation. One early post was unusual; it suggested that perhaps Amazon was really just trying to show how absurd the patent system was, by patenting ridiculous processes:

> I'm in awe yet again... I can't believe that Amazon really expects to keep getting broad-reaching patents without something happening. My only conclusion is that they must be doing this to force the courts to realize how idiotic some software patents can be. And they get to make a buck or two along the way[23].

This theme wove itself through some of the remaining posts, being ranked either "insightful" or "funny" along the way. In some respects the actions of Amazon over the next few weeks were uncanny, given this particular thread of comments on Slashdot. On 9 March, Jeff Bezos wrote an open letter urging patent reform (limiting patents to three years, for example), and thanking the discussions on the net for leading him to this conclusion. Though Bezos might have hoped to be recast as a crusader for patent reform, most articles suggested that this was a response to the widespread criticism Amazon had suffered of late; both the *Los Angeles Times* and the

[23] *http://slashdot.org/articles/00/02/25/222229.shtml*; though it would be natural to assume that this was a "trial balloon" for Amazon executives, there is no direct indication that the poster (an undergraduate student in computer science) had any relationship with Amazon.

Seattle Times suggested that the response was due to Amazon being "stung" by widespread criticism.

Over the next months, the topics devoted to Amazon on Slashdot were sparse: one noted a *New York Times* article by James Gleick, and another noted that the topic would be discussed on NPR's "Science Friday." In each case, most of the comments concluded that there was nothing new in these discussions, or that they (those who were not technically adept) just did not "get it." The irony is that this dismissal of mainstream news came just when it most began to resemble the early posts on Slashdot. The Gleick article cemented the view that the "one-click" patent would remain emblematic of the problems of the patent system. It begins: "When 21st-century historians look back at the breakdown of the United States patent system, they will see a turning point in the case of Jeff Bezos and Amazon.com and their special *invention:* 'The patented One Click® feature,' Bezos calls it."

In the aftermath, we can make some observations about the role Slashdot *appears* to have played. The discussions and attitudes that are threshed out in early discussions on Slashdot seem to be replayed, eventually, in the tone and content of articles in the popular press. The danger of assuming *post hoc ergo prompter hoc* is quite obvious. In fact, it seems as though Slashdot, rather than an active agent, may remain an area in which an *already* élite group make their opinions heard. Those who are eventually quoted within the traditional press tend to have made their opinions

heard on Slashdot first. This does not mean that they would not have eventually been heard without the posts on Slashdot.

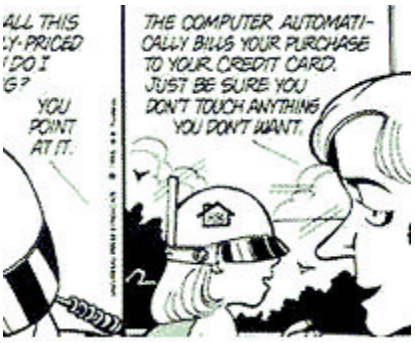
Articles that appeared after Bezos's open letter lend credence to the claim that Slashdot acted as a catalyst in the diffusion of this story. Karlin Lillington, in an article in the *Irish Times* entitled "Web Offers Perfect Vehicle for Instant Debate," notes that she received personal email from representatives of Amazon when she published an article on Amazon's patents, and that these emails became an item of open discussion on various web sites[24]. An editorial in the *Washington Post* suggested that "a grass-roots rebellion has erupted over the past month in the Internet world—as software developers protest changes in patent law that, in their view, could destroy the future of innovation in cyberspace," and recommended strong legislation be crafted to meet these concerns (Ignatius, 2000).

The true measure of the impact of these discussions is the degree to which they influenced the Amazon case specifically and on patent issues generally. Despite Bezos's open letter, Amazon.com's path remains the same. They continue to pursue the suit against Barnes & Noble. Tim O'Reilly put up a $10,000 bounty for those who could demonstrate "prior art" that would invalidate the "one-click" patent. Thirty responses were judged to be particularly helpful, including a 1993 Doonesbury cartoon strip that clearly indicated the idea of purchasing with a credit card in one

[24] While she does not specifically note Slashdot in this article, one later the same year indicates that she follows the discussions on the web site.

click (see fig. 6-1). Though it was unclear as to whether any of these would represent enough of a challenge to nullify the Amazon patent, the possible existence of prior art led to the lifting of the injunction against Barnes & Noble by a federal appeals court in February of 2001 (Hansell, 2001). O'Reilly has continued to encourage debate on patent issues, establishing a weblog for news on patents and related issues[25].

Figure 6-1. "One-click" shopping well before the Amazon patent (Trudeau, 1993).



By the end of March of 2000, the Patent and Trademark Office issued more stringent guidelines in the vetting of process patents (Said, 2000). In October, Congressmen Rick Boucher and Howard Berman (Democrats from Virginia and California) introduced the Business Method Patent Improvement Act of 2000 (H.R. 5364), which further limited the ability to patent obvious processes. No action was taken on this Act before Congress adjourned in 2000, and a similar version has been proposed this year (H.R. 1332; see Taffet & Hanish, 2001).

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[25] *http://www.oreillynet.com/policy/*. Interestingly, this site is supported by Macromedia, who has had its own legal entanglements with intellectual property.

Comparison of Coverage: DeCSS

One of the reasons discussion on Slashdot of the Amazon patents may have abated in the early months of 2000 was that the DeCSS case was just beginning to capture the attention of computer professionals. In some ways, the DeCSS case is more interesting. The technology itself is more arcane, and the arguments are more theoretical. From a practical perspective, it is difficult to see this as more than a group of DVD pirates who want to distribute a program that allows them to steal and distribute DVDs rather than pay for them. The perspective represented on Slashdot was nearly diametrically opposed to this view. Would the views of the computer professionals on Slashdot be framed in a way that they could be translated to the popular media?

Coverage on Slashdot, especially early on, mostly included technical questions regarding how the program could be put to good use. Two topics were posted in October of 1999, the first announcing the availability of the source code on the Livid site, the second announcing a "HOWTO" document on watching DVDs on Linux systems. In the first topic (posted 26 October), larger legal or political questions were secondary to the hope that DeCSS would provide a way of viewing DVDs on Linux systems. The potential for piracy was certainly raised, as were various "fair use" issues (copying DVDs to make sure that one's children did not scratch the original, for

example). The second topic (30 October) included far more discussion of the ethical issues of intellectual property. The relationship to MP3 was brought up frequently and questions of the legal status of the program were raised.

"DeCSS" appeared in a total of 19 topics during the month of November, as it became a *cause célèbre* among the hacking community. Although in some of these it was mentioned only in passing, as a sort of primary example of a desirable feature of Linux or a way of demonstrating how technology interacts with established orders, in many cases it was the main posted topic. A topic on 3 November referenced a *Wired News* story of the previous day that explained how the CSS code was broken. The highest ranked posts this time presented a cohesive view: this would likely provoke a strong response from the film industry (there had been very little comment thus far), as there had been with the VCR, and that the industry would claim that the use of DeCSS would make filmmaking unprofitable. They also presented arguments that disputed these (not yet articulated) claims. The 3 November topic was the first to make mention of the DMCA as a likely legal tool in fighting against DeCSS.

Wired News ran several articles in early November, which were roundly criticized by those on Slashdot as taking the perspective of the motion picture industry, while an article that was presented in an industry journal called *eMedia* took a more open-minded approach that garnered praise from a Slashdot editor. The first mention of the DeCSS program in the popular press came in a 4 November 1999

article in the *Washington Post*. While the MPAA still had not commented on the issue, the article generally noted that the concern for the "average home user" was that the motion picture industry would stop producing DVDs. Though the article quoted Phil Zimmerman (inventor of PGP) as saying that CSS was technically easy to crack, on legal and policy issues, it relied heavily on industry sources. Other articles appeared during November and December, but they were sparse, and generally each reiterated the claim that DeCSS would end the movie industry's involvement with DVD, effectively killing the technology[26].

Posts on Slashdot during November were far more frequent. On 5 November a topic noted that several web hosts had received "cease and desist" letters from the MPAA and on 9 November, a topic indicated that the primary distributor of DeCSS had taken the program off of his site, after receiving a letter threatening legal action. The responses to these topics were overwhelming. Many argued that this was the equivalent of trying to rebottle an escaped genie. There were a few that suggested that the MPAA's letters might be an effective tactic (scaring developers who might improve the program, for example), but most wrote that the Net allowed for global instantaneous distribution that could not be influenced by legal threats. To underscore this point, well over fifty "mirrors"—sites that provided copies of the program—were

[26] A notable exception was CNN.com's reprinting on 8 November 1999 of a *Computerworld* article that included significant analysis from John Gilmore of the EFF. It was included in a section of the site called "Insurgency on the Net." The topic for this on Slashdot referred to it as "a pleasantly Linux biased story." *http://www.cnn.com/TECH/computing/9911/08/dvd.hack2.idg/* .

posted. Since the source code for the program itself was fairly short[27], it was also posted directly as a response (and remains available on the archived pages[28]). This practice would continue throughout the next few months, as new mirrors became available.

At first, the need for this continued distribution looked to be small. A 17 November posting noted that the program was available for download on the large, commercial site Download.com (soon after to be removed). Nonetheless, there were postings that indicated that this was indicative of a hard line against free speech. When, for example, the code was released that allowed for telephone calls to be easily scrambled, one poster noted: "Either way, with some of the recent happenings (*cough* decss *cough*) It might be a good idea for developers working on (usually misunderstood) controversial software to be able to use encrypted voice communication as well as encrypted text."

On 27 December, an "Ask Slashdot" topic questioned whether the problem with policy was not that those in the judicial system did not understand enough about technology, but that technologists did not understand enough about the law. Most agreed that this was, indeed, the case. However, several posters suggested that the

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[27] An implementation by Charles Hannum and Phil Carmody in C called "qrpff" is as follows:

```
#define m(i)(x[i]^s[i+84])<<
unsigned char x[5],y,s[2048];main(n){for(read(0,x,5);read(0,s,n=2048);write(1,s,n))
if(s[y=s[13]%8+20]/16%4==1){int i=m(1)17^256+m(0)8,k=m(2)0,j=m(4)17^m(3)9^k*2-k%8^8,
a=0,c=26;for(s[y]-=16;--
c;j*=2)a=a*2^i&1,i=i/2^j&1<y)c+=y=i^i/8^i>>4^i>>12,i=i>>8^y<>14,
y=a^a*8^a<>8^y<>4]*2^k*257/8,s[j]=k^(k&k*2&34)*6^c+~y;}}
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[28] *http://slashdot.org/articles/99/11/05/1158259.shtml* , *http://slashdot.org/articles/99/11/09/1342207.shtml*

perspective of computer professionals was better rooted in common sense, and better represented social concerns. Because the legal system is by nature adversarial, lawyers tend to promote arguments that are rhetorically strong, but not practical, according to one well-scored contributor. Technologists are not bound by such an adversarial system.

The topic was clearly within the context of what was currently underway at Slashdot. The day before, Slashdot had posted a topic based on a letter indicating that over 70 people had been served with a restraining order prohibiting them from distributing any information related to the CSS system, as part of the California trade secrets suit. This number eventually grew to include over 500 web site administrators. Slashdot was also named as a defendant in the case and had been served notice and a temporary restraining order. A topic on the 29th provided commentary from the editors of Slashdot as a hearing got underway in a Santa Clara court room, and also listed links to coverage of the case in the mass media[29]. Slashdot called on those who could to come and demonstrate at the courthouse, and many apparently did. According to one:

> I also dressed up and showed up. Yes, I am sure our attendance helped a lot. The hearing otherwise would have seemed to be a very standard case of copyright infringement against a bunch of rogue crackers. When the judge saw the number of people, I could tell that he immediately realized that this was not such a simple case by the fact that he immediately suggested scheduling the preliminary injunction

[29] *http://slashdot.org/articles/99/12/29/1017231.shtml*

> hearing on a day that was clear of other business. Having everybody attend helped establish the legitimacy of our side. I think it actually was a deciding factor in who won this hearing. I also think it was probably helped the lawyers who were working pro bono or on a favorable rate realize that they are allocating their pro bono time well by giving attention to this case.

Several noted that someone was passing out copies of DeCSS on diskette and that this had been noticed by most in the courtroom. As it happened, that person was also a contributor to Slashdot:

> Heh heh. I brought the floppies. I made 60 copies using the many aol, ms office, and macintosh disks I've accumulated over the years. I was mentioned in the Wired article (yippee). I'll show up on the 14th with even more disks. Email me interesting articles that you want included. My address is [deleted] AT altavista DOT net. The courtroom is small, only about 50 seats. Let's fill it on the 14th! And the rest of the floor, and the lobby, and the street below. :)

Those who posted responses (including the now obligatory list of mirrors and the source code of DeCSS) continued to be outraged at the suits, and many urged that letters be sent to media outlets that seemed to be missing the point by reporting that DeCSS was a pirating tool. Slashdot was in a particularly interesting position, as a media outlet of sorts itself. The *2600* web site became a primary target of the suits, even though it had "only" linked to sites with the DeCSS code. Very quickly the connections between Slashdot and the traditional press became clear: both with individuals trying to affect news coverage by writing to journalists, and journalists seeking out the opinions expressed on Slashdot.

Because Slashdot was named in the suit, Malda was used as a source in some news stories. A *Washington Post* article (Musgrove, 1999), for example, quotes Malda as claiming First Amendment protections: "We're the media. We can say things." As noted in earlier chapters, this was something of a reversal of his view of Slashdot on other occasions. The article notes that "While Slashdot (slashdot.org) is the sort of Web site a well-read hacker might bookmark, it's primarily a technology news site." The word "hacker" here is clearly used in its negative sense, and the article is suggesting that it seems a little strange that the DVD-CCA would target a "legitimate" web site. This was, by far, among the most complementary articles to the defendants. Many simply referred to it as a suit against hackers (crackers).

Journalists also relied upon Slashdot for further information. Hiawatha Bray's article for the *Boston Globe*, for instance, relied heavily on messages posted to Slashdot. There were several complaints on the board about his article, and he replied to these, as well as contributing to other conversations on the topic. At least in this single instance, the claim that Slashdot attracted journalists could clearly be seen, and in fact their involvement went further than just using Slashdot as a source of ideas, and a dialogue ensued between the journalists and contributors to Slashdot.

Just as Richard Stallman had announced a boycott well after it had been repeatedly discussed on Slashdot, Eric Raymond came out with a statement in early January against the DVD-CCA. One poster felt this was unfair:

> Nothing beats a summary of everything everyone on Slashdot has been saying for 2 months. But hey, now that Eric has said it, it carries weight, right? Maybe I'm bitching a little here, but it doesn't sit right with me that in a community that is so, well, community-oriented, a small number of people get zeroed in on and quoted/printed like they were the second coming. Who are we kidding?[30]

Others responded, as they had in the case of Stallman's announcement, that it is helpful to have individuals to identify a position with, since the opinion of a group is too amorphous to be clearly communicated.

DeCSS remained a central theme in the coming months, appearing in over 80 topics in January alone. The case was heard and a preliminary injunction issued. The MPAA began sending out letters indicating that the DeCSS was in violation of the DMCA, nearly two months after that possibility had been suggested on Slashdot. Johansen, the 16-year-old author of DeCSS, was interviewed on Slashdot after his arrest[31]. The comments posted were consistently critical of mainstream coverage of the case, and considered this coverage to be the result of effective and well-funded public relations efforts by the DVD-CCA[32].

Contrary to these concerns, the tenor of mainstream news accounts of the cases changed significantly from the first days of the injunction. For example, a January

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[30] *http://slashdot.org/articles/00/01/02/2016250.shtml*

[31] In the interview (*http://slashdot.org/interviews/00/02/04/1133241.shtml*) Johansen urges Slashdotters to keep writing to mass media outlets: "As many as possible should write their local newspapers [+ other media] and inform them about this injustice. It's also important to get every computer professional to understand that this is a case of freedom of speech. If the MPAA wins this one, I think DeCSS will become the first computer program in the history to be declared illegal. Banning a combination of assembly instructions... Imagine that!"

[32] e.g., *http://slashdot.org/features/00/01/12/2051208.shtml*

article by technology columnist Dan Gillmor in the *Ottawa Citizen* suggested that the cases "could ultimately help settle key questions about the nature of intellectual property and free speech in the Digital Age," and indicated Slashdot as the catalyst for a groundswell of grass roots support for the defense of DeCSS. Articles in a number of newspapers stopped referring to "hackers" and "pirates." The most frequently quoted sources from the defense were representatives of the EFF, who provided an excellent source of information for journalists who might not be familiar with Slashdot or be able to quickly come to terms with the complex issue. In particular, EFF President John Perry Barlow, who the *Boston Globe* described as "one of the field commanders waging rhetorical warfare against corporate intellectual property owners," provided a colorful resource for journalists in search of perspectives other than that of the MPAA (Allis, 2000). Although there are exceptions, coverage in the mainstream press has continued to recognize that this is a defining case in terms of determining the limits to free speech and the reach of intellectual property in cyberspace. After the EFF became involved in the case, Slashdot was not mentioned in mainstream accounts.

The case is currently under appeal, and still receives attention on Slashdot, though soon after the California case, much of that attention was turned to the larger problem of the DMCA. When compared with the "one-click" patent issue, in this case Slashdot naturally played a more central rôle as one of the respondents in the suits brought by the MPAA. More importantly, though, Slashdot acted as a catalyst,

attracting the collective attention of computer professionals, many of whom actively courted the media. Though they certainly did not display the savvy of many activist groups, the grass roots support for DeCSS attracted the more traditional activists of the EFF to the case. It is difficult, once again, to attribute the change in perspective in the popular press to Slashdot alone. In fact, the number of articles that draw on the EFF as a source suggests that this group had a much larger effect on the eventual tone of articles related to the case. Nonetheless, it would be a mistake to dismiss as futile the early efforts of those who participated on Slashdot to provide information and opinions to journalists.

The Private Public Space

The discussions on Slashdot show the potential of forming a new public space, where conversations can be collectively filtered, consensus reached on a grand scale, and where representative voices emerge dynamically. There are two elements that significantly limit this possibility. First, there is the ever-present pressure of the commercial web. Second, the very exclusionary culture that allows Slashdot to work can (though in practice it rarely does) limit the diversity of voices on the site.

The first suggestions in the mainstream to popularize a boycott of Amazon.com were Slashdot participants. Their project, NoAmazon.com, received considerable coverage in the mainstream media, but was left unmentioned for several

months on Slashdot. Indeed, as noted, the Slashdot story garnered only sporadic attention in the early months of 2000, perhaps in part because the DeCSS story overshadowed it. In late February, Slashdot ran a story on Amazon's "affiliate" patent, with a subheading of "from the noamazon.com dept." Until then, there had been no mention of the boycott site. Some of those involved in the site took this as an invitation to post a message:

> This seems like a worthwhile time to call attention to the efforts of one of my office pals. Visit http://www.noamazon.com for some excellent links to alternative sites for the merchandise purveyed by Amazon.
>
> We've tried to get Slashdot to mention this site as a "quickie" news item, but apparently they are an (ahem) Amazon affiliate themselves. :-)[33]

It is easy to read too much into this. It is true that Slashdot remained an Amazon affiliate (e.g., book reviews had links to Amazon to make purchases), while organizations like the Computer Professionals for Social Responsibility had changed their affiliation to Powell's Books.

Slashdot was started as a very small site, and it is doubtful that any of the original editors—university students at the time—expected it to grow as quickly or as large as it did. Early in 1998, Malda posted a message noting that with over twenty thousand hits a day, the server for Slashdot was likely to crash soon[34]. Although wanting to keep it a hobby, as a student he recognized that he did not have the

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[33] *http://slashdot.org/articles/00/02/25/222229.shtml*
[34] *http://slashdot.org/articles/older/00000560.shtml*

resources to do so. As with other changes to the site, he provided some possibilities and opened the discussion up to the users. Among those possibilities were asking for donations, requiring a subscription, selling Slashdot merchandise, and running banner ads. Most supported banner ads as a necessary evil in support of the site. As one poster wrote: "This site was built on the purity of the nerd. (A principle that has surfaced since hackers have pursued the hack :) With no finaincial [sic] backing or profit motive to be seen. For a site that has done this well, that is amazing. Banners and Corporate backing would destroy this purity." Yet, this contributor recognized that the real-world necessities might require some infusion of money, and that this was fine as long as it affected content as little as possible. Malda's decision was to court advertisers and provide them with small ads that were "not tacky"[35]. Furthermore, he would be "as anal as we can be about the actual ads that get posted," to ensure that they were related to technology in some meaningful way. In a refrain that would be heard many times over the years, Malda assured those who participated in Slashdot that "Advertising **will not** affect what I write."

Once again citing growing costs, in June of 1999, Slashdot was acquired by Andover, a company that produces a number of web sites. Malda noted that he accepted Andover's offer in part because it guaranteed that he would maintain absolute editorial freedom, and because Andover was not a company that sold

[35] *http://slashdot.org/articles/older/00000567.shtml*

anything related to "open source," so there would be little worry that financial interests would affect content[36]. Again, although there were certainly comments posted claiming that this was the end of Slashdot, most supported the sale upon this initial announcement. Yet there remained some question as to whether "selling out" was appropriate. Malda had previously suggested that commercialism was distasteful to many in the community. In a *Wired News* article, he is quoted just a few months before the sale. "The hardcore free-software folks fear that the commercialization of Linux will detract from its origins as free software. Businesses are thought of as inherently untrustworthy" (quoted in Kahney, 1999).

Andover merged with VA Linux, a company selling hardware preloaded with the Linux operating system, in early 2000. The response this time around was not overwhelmingly positive. While many contributors once again thought that this was an acceptable situation as long as there were no obvious changes to the way Slashdot was run, others worried that the ownership would cast a shadow on the objectivity of editorial decisions, regardless of claims to the contrary both from VA Linux and Malda[37]. Strongly worded editorials critical of the new relationship appeared in on *Salon* (Leonard, 2000) and the Webmonkey web site (Greenspan, 2000). The latter noted with disbelief the favorable comments being made about the acquisition:

> Any unbiased appraisal of this merger, however, will yield one difficult but inescapable truth: The camaraderie and high spirits engendered by

[36] *http://www.slashdot.org/articles/99/06/29/137212.shtml*
[37] *http://slashdot.org/articles/00/02/06/1620220.shtml*

> Linus and his band of programmers will soon be replaced by the same rancor and factiousness that permeates the rest of the capitalist world. And Slashdot, which is so highly revered by its readers and those who know its mission, will soon lose its trust, reputation, and standing.

The issue was not necessarily whether or not VA Linux would influence the content of Slashdot, but whether the *appearance* of such a bias would make the web site and its editors hopelessly suspect. Malda makes clear that he is aware of this possibility both in interviews and in the Slashdot FAQ.

As noted in the first few chapters, open source exists at an interesting cusp between commercial and anti-commercial activity. While most of those who participate on Slashdot are against software patents and the ownership of source, most are likely employed by companies that produce or maintain commercial software. Microsoft, while referring to open source software as a "cancer," also makes use of free software in their own operating system and uses free operating systems to run some of its most critical high-traffic servers (like those supporting Hotmail). Some adhere to the anit-corporatism of Richard Stallman, others to the pro-business position of Eric Raymond, and a very large number to both of these positions at once. That Slashdot is owned by a corporation does not automatically disqualify it as a public place for discussion, as long as biases are made clear at the outset. At the same time, as has been shown in Slashdot's case, this is a creeping phenomenon. Had Malda decided in 1999 to sell to a large corporation, the reception would not have been as congratulatory as it ended up being.

There is no real "solution" to the influence of moneyed interests on public discourse. Short of social and political changes, running a large web site incurs large expenses, and those expenses need to come from somewhere. It may be that a subscription system of some sort would allow for self-support, but it would also make the space explicitly private. Another option is a model that continues to support Usenet, a distribution of the computing power needed to run the discussion, as well as of the editorial process. Such a system would work well within a community that prefers collaborative and volunteer work.

In any case, as Slashdot continues to exert influence over both news in the mainstream press and policy, it is important to recognize the potential for influence from the owners of the discussion space. While, with a few exceptions, Slashdot has maintained its position as a neutral channel for news and discussion, there is little guarantee that this will continue to be the case indefinitely. Slashdot has ceased to be an exception in a web filled with large news sites with corporate connections to the industry they report on.

Linux for the Numbnut!

A second, and more far-reaching problem, for Slashdot and for open source generally, is the sometimes felt meritocratic élitism among Slashdot contributors. Those who are perceived to be technologically less competent, and especially those

who base arguments on faulty or incomplete knowledge of technology, are often ostracized by the community. More importantly, perhaps, the emancipatory message of open source software is sometimes seen as extending only to those who are skilled with computers. The Linux operating system is seen by some to be the exclusive plaything of the technologically able, and making it more "user friendly" is equated with "dumbing down" software. This is not a prevalent view, but it is also not difficult to find.

The two sides were represented well in a discussion following an announcement that AOL would be producing software for Linux machines[38]. It should be noted that those who access the net via AOL have long been looked down upon by early internet users. This was in part because AOL rapidly brought a large number of neophytes into contact with the web, and many of the *hoi polloi* were painfully unaware of "netiquette" (when the number of internet users was small enough that this term still made sense). Additionally, AOL users were forced to view the web using AOL's proprietary, and faulty, browser. As a result, those with an aol.com email address were often derided in discussions.

Thus, a Linux initiative from AOL seemed somehow discordant. An early post went with the subject heading "Yes! Linux for the Numbnut!" Though it could be read as a sarcastic endorsement, the poster made clear that she was serious. Many others

[38] *http://slashdot.org/articles/00/08/13/137233.shtml*

replied, debating the suitability of Linux for the common user. Most noted that Unix variants like Linux were already widely used by those who knew next to nothing about the operating system, as in the case of artists who used SGI systems. Others suggested that Linux did not necessarily have a steeper learning curve than Windows at this stage, but that most people had already become familiar with Windows over a period of years.

At one point someone posted that he was 21 years old, has used Microsoft operating systems for most of his life, and has had serious difficulties learning to use Linux. The response, from a long-time reader of Slashdot (UID in the 4000 range), was "My kids are using Linux form the 3 year old to the 12 year old. They find it easy. So if you can't use it, then it must be YOU - But it sure as hell isn't Linux." This attack on personal abilities, skill, knowledge, or industriousness is not uncommon. While well-informed questions are often cheerfully answered, obvious questions are sometimes derided[39]. A later post places this view in historical context:

> I don't want lame AOL-ers on Usenet...
>
> I don't want lame AOL-ers on the Web...
>
> I don't want lame AOL-ers on L1NUX...
>
> nothing stays l33t...[40]

[39] And have been well before Slashdot was established. RTFM (exhorting the questioner to "Read the Manual") was a common 4-letter retort from the early days of Usenet.

[40] As noted in chapter 3, the use of "133t" signals that this may be, at least in part, in jest. The spirit of the message is, however, indicative of a more general attitude.

Indeed, this view runs well before Usenet. Moravec (1998) traces the history of interactivity with electronic computers: from hard wiring on the ENIAC to dials, then from machine code to assemblers, then to high-level programming languages, and finally to the GUI. At each stage, he notes, there were those who looked down upon the new users. The true hacker felt that assembly code (which allowed for machine instructions to be made with keyword identifiers like ADD rather than purely numerically) was only for the lazy who were not skilled enough to use machine code directly. Similar feelings can be found at each level of abstraction within the hacker community.

At the same time, there are many, perhaps a majority, who feel that it is important to break down these barriers. While knowing a great deal about technical matters remains a mark of prestige *within* the community, creating systems that are usable by everyone is also lauded—as in the case, for example, of Mandrake's easier-to-install distributions of Linux, or the Python programming language which is well-suited both to beginning programmers and for use on large projects. This sort of schizophrenic élitism is tied to the special sort of subculture that hackers have formed. They are at the same time the children of the controlling classes, and increasingly a diverse (in terms of class, race, sex, and education) community (Ross, 2000). While dominant cultures routinely assimilate counter-cultural movements, hackers have done

just the opposite, and are able to speak with some fluency both the languages of dominance and resistance.

Slashdot has been described in this dissertation as a nexus, a place in which connections are made. Some degree of exclusivity is natural, and perhaps even required for some form of community cohesion. However, when this élitism blocks off connections to a larger group, it leads to precisely the sort of technocratic segmentation that ensures technology is used as a tool of the powerful, rather than a tool of the people. For computer professionals to play the part of the organic intellectual, they must be both willing and able to connect the sometimes occluded world of technology with a larger public.

Summary

Above, reporting and discussion of two particular court cases of interest to members of the open source community were tracked, both as they were presented in Slashdot discussions and as they were presented in the traditional media. In both cases, one is struck by the degree to which opinions expressed on Slashdot in the hours and days after an event eventually made their way into depictions of the event in the press. It is easy to find the influence of press releases, government sources, and public relations in early stories. However, as coverage becomes more careful, the perspective that dominates Slashdot often comes to the fore. The mechanism that allows this to

happen—whether it is individuals who participate on Slashdot and are spurred to individual action or journalists who use Slashdot as a resource—is less important than the fact that opinions of the Slashdot community are eventually felt by the mass media and by policy-makers.

The degree to which this is really a grass-roots, inclusive movement is limited by two major factors: the commercialization of the web (and of Slashdot) and the exclusionary practices of the community. In both cases, the open nature of the sites allows for continuing critique to accompany these inhibiting factors. When editorials seem biased or when an uninformed opinion is met with unfair vitriol, the community can be counted upon to smooth things over and filter out those elements that would harm Slashdot as a community and as a public space. Nonetheless, the greatest threat to Slashdot remains the possibility of commercialized bias and the arrogance of an entrenched cultural élite.

This dissertation is predicated upon the idea that Slashdot makes a difference; that it is both an interesting form of interaction on a large scale and that it is uniquely able to connect ideas and people. The preceding two chapters discussed how these connections occurred within the hypertext of the web itself. In this chapter, we have seen that the influence of Slashdot extends beyond the web. In some ways, this should not be surprising. When we compare the million readers that follow Slashdot every day with the circulation of newspapers and even some television news, it would be

surprising if it had no effect. But Slashdot is a special case, because a large proportion of its readers also generate that content, and the community that makes up Slashdot helps to make it a particularly effective force for creating new public space.

Chapter 7:
Conclusions

This dissertation began with two tentative hypotheses: that, as the prototypical collective weblog, Slashdot represented a technology that allowed for conversation and consensus on an unprecedented scale; and, that as a result, the site acted as a kind of bridge between ideas and people. In completing the investigation of the site several things became apparent. In the end, Slashdot does exhibit the characteristics hypothesized, though not at all times and on all topics. The culture of the site helped to make it what it is. In some ways, it is the ideal medium for social movements, supporting non-hierarchical consensus-making without descending into bickering. It represents a public sphere in a raw form. It also serves, as the activities of social movements have in the past, to connect ideas and people that have hitherto been separated. The ability to join disparate parts of the web together should not be underestimated, but Slashdot does more than this, allowing for the views of participants to gather momentum and enter into the consciousness of a larger public through the traditional press.

While Slashdot may represent such a potential, in practice the culture and the connections are far more complex. Further study is both warranted and promising. In the remaining pages, the fundamental findings of this dissertation will be reviewed and

discussed, followed by a short discussion of the limitations of the eclectic approach taken here and a suggestion of where there is a potential for further research.

A Technology and a Cultural Milieu

Slashdot is a cultural technology. It is tempting to divide the "open source community" and the weblog technology. After all, there are now several websites that have replicated the Slashdot approach to social filtering and discussion, with varying degrees of success. Many of these, like the Independent Media Centers and *infoshop.org* had little to do directly with information technology. However, they have found that with a certain "critical mass" a site can provide high-quality information and serve both as a community and as a source of information and education for a larger public. Moreover, they have found that these larger, self-organizing groups can succeed where smaller groups do not.

The dividing line, then, is not between "open source" and the technology. The technology is intricately tied to the social structure needed to successfully encourage conversation and other contributions. Rather the error is in assuming that the "open source community" is inherently tied to computing. Even though the term has already come into use in other venues, most programmers would fail to see the utility of the term in contexts outside of computing. After all, open source implies some kind of source code, and—at least in the literal sense—source code is an idea unique to

computer programming. On the other hand, many have noted that those who created the open source "movement" were simply continuing the traditions of the academy, a tradition that valued transparency, communication, and openness. It would be a mistake to assume that computer programming was central either to the technology of Slashdot or the culture of open source.

The technologies of Slashdot extend beyond database and web servers, and beyond the source code that allows messages to be posted and scored. Much of what makes Slashdot work as a technology is the culture that surrounds and pervades it. In this, it is not unlike any other communication technology. However, Slashdot allows us, as scholars, to observe that culture in a way we never have before. There is certainly a loss of context when it comes to on-line communication, but the participants and the observers are on a level field in the case of Slashdot. The culture is laid out in millions of lines of text, to be discovered by a patient researcher just as it was by the Slashdot contributor. The patterns of inclusion and exclusion, the cliques, the techniques, the shared knowledge—all of it is represented as text.

For it to work as a technology, there has to be a shared set of objectives and ideals. These need not, and were not, planned in advance. Rather, they emerged over time, and adjusted to the structure of the board even as this formal structure adjusted to the culture. This should not be seen as removing any of the credit for the site from Rob Malda or his colleagues. Their work in creating and managing the site was a

necessary, but not a sufficient, component of the Slashdot success. As sites like the now-defunct *technocrat.net* show, similar or identical web sites, with equally talented editors, may not be successful. The exclusionary meritocratic hazing that takes place on Slashdot exists for a reason. Without the power to exclude, even in the most rudimentary way, there can be no cohesive structure. An understanding of the history and culture of Slashdot is a necessary part of understanding the technology.

Slashdot as a Tunnel

As a technology, Slashdot requires a cohesive culture, but what does this technology *do*? It does not exist solely to perpetuate its own culture. Slashdot is successful because it is the first to provide news of interest to the community. It is able to do this by creating a confluence of paths. These paths are of two kinds. First, it attracts a wide readership, many of whom contribute to the site. Any newspaper would be envious of a staff of hundreds of thousands of researchers, no matter what their skill level. By turning participants into contributors, Slashdot harnesses the real power of the mass public.

The challenges of Nupedia serve as an illustration of the strength of this idea. Nupedia was created as an "open source" encyclopedia. Its intent was to create a new encyclopedia that was part of the public domain, but that was rigorously peer reviewed. The process of recruiting volunteers to edit, review, and assign each article

has thus far proven to be too great a task. Instead, the editor of the encyclopedia has added a more open forum in which articles can be contributed and edited without the more formal review process (at least at the early stages). Those who contribute to Slashdot do not think of themselves, necessarily, as performing a public service. Instead, the culture of Slashdot honors those who know about something first. The best way to demonstrate this knowledge is to submit a story.

Perhaps even more importantly, Slashdot can serve to connect a culture that has traditionally been highly geographically distributed. The need to fight against the DMCA has demonstrated how vital these connections can be and has also left Slashdotters questioning how they can more effectively influence policy[1]. Encouragement to "call your congressperson" is easy to find, but translating Slashdot's highly mediated system of communication into traditional political action is difficult. Those who usually work on projects that are distributed and computer-mediated are often reluctant to begin demonstrating physically, but, as one poster noted, "if a tree falls on the Internet, and there's no members of Congress there to hear it, does it make a sound?" Groups of twenty or thirty self-professed geeks can be assembled on short notice to be physically present and demonstrate, but getting larger groups to come together physically is far more difficult. Electronic forms of protest can only go so far, though they certainly can exert some influence.

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[1] The topic at *http://slashdot.org/articles/00/03/28/1813204.shtml* treats this question directly.

Slashdot has been marginally more effective in making the connection to the mass media, and especially to newspapers. Early in this dissertation, the link between journalism and Slashdot was drawn. As Andrew Gordon (1998) has noted "The Internet is already thousands of experiments, all of which are designed to solve the news problem as people see it now." Slashdot has done better than most in this regard. It has established a large audience and a novel way of interacting. Does this mean it is poised to take over from the traditional newspaper? Especially given that many newspaper publishers see the future of news as web-based, it seems as though this is a reasonable conclusion (Fost, 1999). An article by Jon Katz that appeared on Slashdot[2] seemed to make a similar suggestion, predicting the "rise of open media." However, Slashdot is a very different sort of venue for news than the newspaper, and serves a different function. Despite its successes and large audience, it is designed for a particular niche, and hopes to foster community among those who share those similar interests. Although mainstream news may be too focused on the mass at present, that does not mean that such broad news sources are unnecessary. In the two cases above, Slashdot shows itself to be a very good intermediary between the popular press and more grass roots exchanges of information. Just as the comment from Jeff Bates (Hemos) presented in chapter six suggests, Slashdot also connects the mainstream press to the unusual perspectives available on the Net. Of course, any search engine

[2] *http://slashdot.org/features/00/06/19/1714239.shtml*

might be able to link a journalist with some of the more unusual portions of the web, but Slashdot includes a mechanism to add credence to voices that otherwise do not have access to institutional mouthpieces. With the assurance that hundreds of thousands of computer professionals value a particular perspective, the journalist is provided with an interesting collective source of information.

Many contributors to Slashdot are quite willing to admit their ignorance of law and methods of effecting political change. They are not disinterested, but many have not until recently been exposed to policy about which they feel they have an expert opinion. As government regulations begin to affect computers and networks more extensively, those who have until recently been only mildly influenced by government regulation find themselves in a new environment. The EFF, which has demonstrated its effectiveness in fighting against the Communications Decency Act and other badly formed policy, remains in a position to best act as an interface between traditional institutions and the culture of hackers. This does not, however, affect Slashdot's function as a *place* and a *mechanism* for open discussion among a large group that shares some underlying ideology, while representing a wide range of objectives and opinions. To be able to effectively work to fulfill this need for a forum—a space of connection—Slashdot will need to overcome the two challenges noted at the end of chapter six: safeguarding the community from commercial influence and technological élitism.

The second way that Slashdot creates a confluence of connections is related to the hyperlinked structure of the web itself. The "Slashdot Effect," is more than an interesting phenomenon and an annoyance to web authors[3]. It provides for a real sense of news, for connecting ideas and people that have not been (and likely would not be) connected without Slashdot. There is the obvious question of how many of these types of tunnels the web can realistically support, but the explosion of both personal and collective blogs over the last year suggests that there may be a need for such connections.

Chapter four presents a way to measure the existence of such tunnels, and even, potentially, to track them down. Sites like Google have shown that using information about a linkage structure can provide some indication of "prestige" or the utility of a given site. A similar approach may be valuable in seeking out these "choke-points" on the web. While they may not provide the answer to your question, they are the best escapes from the balkanized clusters that are widespread on the web. The structural nature of the tunnel is not all that needs to be considered. Memepool.com, for example, also unites disparate parts of the web. Slashdot,

[3] It should be clear that while many of the sites that are "Slashdotted" enjoy the attention brought about by being listed on the site, the Slashdot Effect refers specifically to the crashing of a server under the sudden spike of traffic. While the intent may be different, the effect is similar to a distributed denial of service (DDOS) attack like those used by crackers and by those engaged in information warfare. As a web site detailing a rail gun project by some MIT students shows, the attention is not always welcome (*http://www.railgun.org/*).

however, not only connects widely, it also filters those collections, providing only the best ones to the community.

The "Zapatista Effect" and the "Slashdot Effect"

Slashdot provides a vital and unprecedented "short cut" between not only disparate parts of the web, but between those on the front lines of "world building" and traditional media and policy-making venues. While it is easy to link processes on the world wide web at large to earlier mass media, Slashdot represents a system that allows for interaction and participation on a scale that has real consequence. Although many "virtual publics" have been established using different technologies and different focal points, creating a system that allows for public spaces to work even as they grow very large in scale is important (Jones, 2000). As a technology of discussion, Slashdot holds the promise that large groups can come together and reach some form of consensus through conversation—and equally importantly, the process itself can be enjoyable. As rival systems are introduced, this ability to host "large-scale discussions" may also be enhanced.

While we cannot assume that the technology alone will provide a solution to social problems, we can map out the shifts in who controls these powerful communication devices, and hope to influence this control (see Melody, 1994). We need to ensure not merely universal access, but an appropriation of technology, and

more importantly, encourage "instances where the architecture of communication systems is planned" by those who participate in communication rather than a small élite (Mattelart, 2000, p.118). This architecture is, on the internet, created almost entirely of code. Placing the control of code in the hands of its users allows them to influence the development of these systems in a way that has been very rare beyond the earliest stages of new communications technologies.

If this is to be the case, Slashdot must be the *first*, rather than the *only*, arena of this type. There have already been Slashdot-like alternatives established. Bruce Perens, for example, created *Technocrat.net* to discuss technology policy issues. Unfortunately, like most ventures in this area, the site failed to attract a critical mass of posters. *Kuro5hin.org* (which carries the motto "technology and culture, from the trenches") has a strong and loyal following, as do a number of sites devoted to a wide range of topics outside of "news for nerds." There are now hundreds of other small sites that are running the Slashdot code or systems based upon it.

In 1998, Harry Cleaver wrote of what he called the "Zapatista Effect." The use of computer networking by the Zapatista movement had created a chain reaction, and NGOs around the world were drawing together networks that were both based upon and connected to the Zapatista networks. He writes that:

> The Zapatista effect suggests that the fabric of politics—the public sphere where differences interact and are negotiated—is being rewoven. This is particularly important because these new forms of

> cooperation go to the heart of the existing political, social and economic order.

It is too soon to know whether the real effect of Slashdot will be similar, but there are indications that the potential for this exists. More than half of those who live in the United States access the World Wide Web with some regularity. However, for most of these surfers, the web is little more than a badly written encyclopedia combined with a poor television show. This sad state of affairs has been encouraged by large media corporations that have little interest in exploring new forms of interactivity on the Web. What is needed is a move from the mass society to what C. Wright Mills (1956, c.13) called a "community of publics." These publics are defined by the ability to reply immediately to ideas, where as many people express as receive opinions, where action may be taken based on consensus (even action against authority), and where organs of authority have limited reach. Sites like Slashdot, though not ideal, represent a new kind of space for communication, and a way of connecting dissimilar people and ideas. Already, Slashdot has encouraged imitators, some of which are better (if not larger) than the original. While obstacles remain, there is the possibility of a new kind of "Slashdot Effect," as the Slashdot system encourages communities of talk around issues and ideals. Slashdot, even unwittingly, may act as a vanguard public[4].

[4] "Computer nerds aside, there is no junta driving this process of change" (Shapiro, 1999, p.11). This idea of an unconscious revolutionary, and one that thrives upon the creation of a supportive community, finds expression in the not so different world of hotrodders, according to Harvey Sacks (1979).

This dissertation has looked specifically at the case of Slashdot, not because what occurs there is generalizable to discussions on the web at large, but because it represents an *original* way of organizing mass interaction. The argument is not that Slashdot *does* tell us about the place of interactive web sites in policy and social concerns, but rather that it provides clues as to what that place *could* be. Too much attention is focused on the extremes of interaction via computer networks: individual or small group on one side, and newly incarnated mass media on the other. Both the promise and the peril of the internet rests between these two, at the level of "mass interaction." A better understanding of how information and culture flows within this partially ordered region will result in a better understanding not only of computer networking, but of social systems generally.

Limitations and Further Research

Though many have recognized these new large-scale communities as intriguing areas for research, there still remains little in the way of extensive work in the area. This dissertation represents a first attempt to describe in an empirical way one of the technologies that allow for mass interaction, and its larger media context. As such, it represents only a modest foray into a field that is ripe for further exploration.

There are any number of ways of observing and describing culture. The first four chapters of the dissertation have relied heavily on self-descriptions from leaders in the open source community, and on observations of communicative strategies employed by posters on the board. The conclusions reached—that Slashdotters rely on technical knowledge and on humor as a way of marking the "in-crowd"—are not shocking. Indeed, they confirm what has been found time and again in studies of on-line behavior. The work done here does not go far enough in charting the result of such practices. It suggests that the formation of cultural norms are necessary to the functioning of the system, but further evidence would allow for a more detailed taxonomy of the strategies used by interlocutors. Further study might include computer aided textual analysis to help discover trends in conversations over time, as well as gradual changes in the content of the board over time. The relatively easy availability of an electronic corpus would make such studies particularly effective.

The investigation of the linkage structure is also modest but informative. It is too early to generalize from a single case to the web at large, but some of the measures drawn from this research should allow for comparison with other parts of the web. Clustering, as well as measures of density and clustering density, provide at least a rudimentary understanding of a web site within a larger context.

The visualization approach, as explained in chapter five, is both the least complete and among the most promising of the approaches taken here. The basis of

the visualization process, an assumption that novice and experienced users alike are more able to comprehend data presented in familiar imagery, is open to experimental testing. By developing the visualization system further into a real-time, browsable three-dimensional environment, its practicality as an interface to large networked structures can be better understood. While certainly showing promise, it will require significant development before being an effective way of displaying such information.

Finally, the two cases presented in chapter six present some anecdotal evidence of a connection between the traditional media and Slashdot. A more thoroughgoing investigation might examine a period of time and record news coverage in both traditional and on-line media to see whether a diffusion pattern was detectable. This, along with directly interviewing or surveying journalists who make the news, would provide a much better view of the degree to which the on-line world can act as an intermediary—a "metamedium"—for the diffusion of grass-roots opinions and ideas.

Some may criticize this as an extraordinary amount of attention paid to a transitory phenomenon. Like every fad on the web, weblogs will eventually disappear, they might claim. As with any new technology, groups experiment with different approaches to structuring the internet socially. Studying the Slashdots of today, critics might argue, is the equivalent of studying *Telefon-Hirmondo* (an early attempt at "broadcasting" over the telephone) a century ago. However, this is perhaps the best argument in favor of studying Slashdot now. Slashdot represents a new way of

organizing not just technology, but people. By better understanding the factors that allow this to happen, even just temporarily, we may assemble some of the keys to more democratic communication technologies. Knowing these principles allows us to better protect them in the future.

Acronyms

ASP: Application Service Provider

ccTLD: Country Code TLDs (e.g., .us or .au)

CDA: Communications Decency Act

CGI: Common Gateway Interface

CM: Community Memory

CMC: Computer Mediated Communications

CSCA: Computer Supported Collective Argumentation

CSS: Content Scrambling System

DDOS: Distributed Denial of Service

DMCA: Digital Millennium Copyright Act

DNS: Domain Name Server

DVD-CCA: DVD Copy Control Association

EFF: Electronic Frontier Foundation

FAQ: Frequently Asked Questions

FSF: Free Software Foundation

FUD: Fear, Uncertainty, and Doubt

GIF: Graphics Interchange Format

GIS: Geographic Information System

GNU: GNU's Not Unix

GPL: GNU Public License

gTLD: Global Top Level Domain (the standard 3-letter TLDs).

GUI: Graphic User Interface

ICANN: Internet Corporation for Assigned Names and Numbers

IETF: Internet Engineering Task Force

ISP: Internet Service Provider

IT: Information Technology

LUG: Linux Users Group

MDS: Multi-Dimensional Scaling

MOO: MUD, Object-Oriented

MPAA: Motion Picture Association of America

MUD: Multi-User Dungeon / Multi-User Domain

NGO: Non-Governmental Organization

OSD: Open Source Definition

OSI: Open Source Initiative

P2P: Peer-to-peer

PCA: Principal Component Analysis

PGP: Pretty Good Privacy

PNG: Portable Network Graphics

RFC: Request For Comments

RMS: Richard M. Stallman

RIAA: Recording Industry Association of America

SDMI: Secure Digital Music Initiative

SOM: Self-Organized Map

TCP/IP: Transmission Control Protocol / Internet Protocol

TLD: Top Level Domain (e.g., .com or .uk)

URL: Uniform Resource Locator

WIPO: World Intellectual Property Organization

VR: Virtual Reality

VRML: Virtual Reality Modeling Language

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Appendix A:
"Are You Serious?"

The following is a segment of responses from a set of posted in early 2001. The

original can be found at *http://slashdot.org/askslashdot/01/01/03/044219.shtml.*

Is The U.S. No Longer The Choice For Freedom?

Posted by Cliff on Wednesday January 03, @12:43PM
from the how-much-wee-weeing-on-the-constitution-will-we-stand-for dept.
Kasreyn asks: *"I'm personally getting worried (OK, paranoid) due to all this stuff I'm seeing on Slashdot. It seems like corporations have no desire other than to strip us of what few remaining freedoms we have, and the government is doing nothing to check their power scramble. What I'm wondering is, just how bad IS it? Is the United States still the best choice of a place to live for safety, freedom, and quality of life? I used to be all patriotic and really I believed that...now I'm not so sure."*

"I've been keeping my eye on other nations as places to live, and tallying whether they are cutting down on their citizens' freedoms, as well as whether they seem likely to be in any wars in the next 50 years... I'm personally getting tired of living in a nation where apparently no one in the capital city has read its constitution, or gives a damn. Where everyone elected to high political office breaks the oath they all take, to uphold and protect that same constitution.

I'd love to hear what my fellow Slashdotters have to say on the subject. If not the U.S., then where should I go? Please, no national biases, give me some actual info about places worth living. I'd like to get some ideas on this NOW though, so that if I decide to leave I can get out before doing so becomes a problem. (Did I mention I'm probably too paranoid about this?)"

Are you serious? (Score:5, Interesting)
by Teethgrinder **(sd@oos.org)** on Wednesday January 03, @12:49PM EST (#15)
(User #2842 Info) http://www.oos.org/

This is not meant inflammatory but I'm really irritated by this statement: *Is the United States still the best choice of a place to live for safety, freedom, and quality of life?*

Do you really mean that? What led you to believe that this ever was the case?
I really have trouble grasping this US sense of patriotism.

Seriously, I'm just curious...

Re:Are you serious? (Score:1)
by Pahroza **(pahroza@NOSPAM.secureshell.com)** on Wednesday January 03, @12:57PM EST (#73)
(User #24427 Info)

How is this different than the sense of patriotism that anyone feels for his or her country?

Re:Are you serious? (Score:1)
by tjansen **(tim@tjansen.de)** on Wednesday January 03, @01:18PM EST (#224)
(User #2845 Info) http://www.tjansen.de

>>How is this different than the sense of patriotism that anyone feels for his or her country?
Does everyone do so? It is completely unlogical to do this. No country gets better because you live in it. It may be that you are USED to it and dont want to miss it, but it does not increase the quality of living, freedom etc..
(I want to be able to correct my comments after posting them.. sorry for my typos)

Re:Are you serious? (Score:2)
by jandrese **(jandrese@vt.edu)** on Wednesday January 03, @01:51PM EST (#465)
(User #485 Info) http://www.cslab.vt.edu/~jandrese/

Personaly I like to think that I'm making my country a better place.

Be careful with the "Redundant" tag when reading Newest Post First.

Re:Are you serious? (Score:4, Interesting)
by Blue Neon Head on Wednesday January 03, @12:58PM EST (#85)
(User #45388 Info)

This is not meant inflammatory but I'm really irritated by this statement: Is the United States still the best choice of a place to live for safety, freedom, and quality of life?

Do you really mean that? What led you to believe that this ever was the case?

What led you to believe that it wasn't? In which nation would you prefer to have spent time in before WWII? Americans enjoyed a higher standard of living, higher per capita income, and more freedom than most Europeans did, with the added bonus that we weren't ravaged by war every decade or so. However bizarre this "US sense of

patriotism" may be, and however much stupidity may manifest itself here, it's hardly jinogistic to say that, in general, Americans have had it better than most.

Re:Are you serious? (Score:5, Insightful)
by Tackhead on Wednesday January 03, @01:05PM EST (#121)
(User #54550 Info)

> Is the United States still the best choice of a place to live for safety, freedom, and quality of life?

Safety, freedom, quality of life. Choose any two.

Re:Are you serious? (Score:1)
by scowling **(bigkahuna@scowling.net)** on Wednesday January 03, @01:27PM EST (#307)
(User #215030 Info) http://www.scowling.net

> *Safety, freedom, quality of life. Choose any two.*

Or, live in Canada, and get all three.
--
www.scowling.net. All evil. All the time. Coming soon.

No -- can't have both safety and freedom. (Score:3, Insightful)
by cduffy **(cduffy at bigfoot dot com)** on Wednesday January 03, @01:48PM EST (#442)
(User #652 Info)

You can't have safety and freedom, even at the cost of QoL. The measures used to guarantee safety are, when overextended, what kill freedom. The relationship of these two to quality of life is something I'm not going to speculate on.

Re:No -- can't have both safety and freedom. (Score:1)
by Hallow on Wednesday January 03, @02:56PM EST (#730)
(User #2706 Info) http://hallow.webmages.com/

"They that can give up essential liberty to obtain a little temporary safety deserve neither liberty nor safety."

Ben Franklin, Historical Review of Pennsylvania.

freedom vs justice (Score:1)
by mrBlond on Wednesday January 03, @06:59PM EST (#1244)
(User #141708 Info)

Absolute freedom mocks at justice. Absolute justice denies freedom. - Albert Camus
--
mrBlond
Time flies like an arrow, fruit flies like an old banana.

Re:Are you serious? (Score:1)
by MyopicProwls on Wednesday January 03, @02:10PM EST (#572)
(User #122482 Info) http://www.dartmouth.edu/~nrrinard/

That's easy. Freedom, quality of life.

MyopicProwls
My homepage

Re:Are you serious? (Score:1)
by theguru **(theguru@technologist.com)** on Wednesday January 03, @02:41PM EST (#697)
(User #70699 Info)

Then you better excercise those new found freedoms to arm and defend yourself, because if you have a better quality of life than enough people, you can expect them to come and try to make it their own.

Re:Are you serious? (Score:1)
by Zemran on Wednesday January 03, @05:24PM EST (#1087)
(User #3101 Info)

OK, I choose Safety and Freedom !!!

2 things lacking in the US.

Re:Are you serious? (Score:1)
by shking on Wednesday January 03, @06:09PM EST (#1168)
(User #125052 Info) http://www.cuug.ab.ca/~babulicm

>Safety, freedom, quality of life. Choose any two.

1. Safety, Quality of Life
   Try Canada or Scandinavia
2. Freedom
   One reason why OpenBSD development happens primarily in Canada and Scandinavia

-- "At Microsoft, quality is job 1.1" -- PC Magazine, Nov. 1994

Re:Are you serious? (Score:1)
by Lokinator on Wednesday January 03, @07:48PM EST (#1295)
(User #181216 Info)

Thailand? How do folks feel about Thailand as an alternative? Or, perhaps, some of the Islands in the Carribean?

Re:Are you serious? (Score:1)
by Desperado **(johnnick+sldot@pixi.com)** on Wednesday January 03, @11:16PM EST (#1470)
(User #23084 Info) http://www.pixi.com/~johnnick/homepage.html

You can't have safety and freedom, even at the cost of QoL.

Of course you can. I think you mean that if the *Government* guarantees your safety then it would impinge on your freedom. However, as an individual, you could have safety and freedom by making some QoL decisions like moving to a low risk neighborhood or state. Fortify yourself, take martial arts training ... whatever. Depending on your QoL needs, it seems to me you could, in fact, have all three - Freedom, Safety and Quality of Life just don't ask the government to do it for you.

-- A little inaccuracy sometimes saves a ton of explanation. H.H. Munroe

Re:Are you serious? (Score:5, Interesting)
by matman on Wednesday January 03, @01:05PM EST (#122)
(User #71405 Info)

Canada's not too bad - although I can't really compare it to other countries...

Here, even child pornography has been found to be protected under free speech laws. That's kind of nutty, but it shows that we're serious about free speech, even if we have to take the bad with the good.

The only major invasions that we've had (that I'm aware of), were the Americans trying to take the country; apparently Canada is their 'manifest destiny' or something like that.

Re:Are you serious? (Score:1)
by JJC **(firstname (at) lastname.co.uk)** on Wednesday January 03, @01:11PM EST (#173)
(User #96049 Info)

Here, even child pornography has been found to be protected under free speech laws. That's kind of nutty, but it shows that we're serious about free speech, even if we have

to take the bad with the good.

Can you explain that a bit? The context, or details of any court cases or anything like that?

Re:Are you serious? (Score:1)
by matman on Wednesday January 03, @01:17PM EST (#212)
(User #71405 Info)

http://cbc.ca/cgi-bin/templates/view.cgi?category=
Canada&story=/news/2000/01/19/childporn000119

There should be more on cbc.ca if you search for 'child porn sharpe' or something like that.

Re:Are you serious? (Score:2, Informative)
by Tackhead on Wednesday January 03, @07:18PM EST (#1259)
(User #54550 Info)

> The context, or details of any court cases or anything like that?

Parliament passes a really stupid law, that lumps *Romeo and Juliet* (hey, the protagonists were 12 and 13) in with the Bad Stuff.

A court says "I can't invalidate only a portion of the law, I have to nuke the whole thing in the name the Charter's guarantee of freedom of expression."

Parliament says "We'll invoke the notwithstanding clause and override the court, because we believe the country's a better place for it, notwithstanding the fact that you found the law to be unconstitutional."

Court says "Go ahead. We dare you."

Parliament chickens out.

IMHO, chickening out was the right thing - the notwithstanding clause is an abomination, and is never used lightly (and IMHO shouldn't be there, and as long as it is there, still shouldn't be used).

Unfortunately, Parliament's subsequent (in)action of *not* getting off its duff and passing a *constitutional* law to replace the one the court overturned, was, and remains,

inexcusable.

Doubly-unfortunately, that's what happens in a Parliamentary system with a majority government. No fear of the opposition humiliating you means you have no incentive to fix things when they break. And no incentive *not* to break things in the first place.

Re:Are you serious? (Score:1)
by mjh on Wednesday January 03, @01:13PM EST (#188)
(User #57755 Info)

> *Canada's not too bad*

Yeah, but it's a bit nippy. International Falls, MN borders Canada. It's also the coldest spot in the continental US, but it's a southern point in Canada!

Re:Are you serious? (Score:1)
by Furr on Wednesday January 03, @01:30PM EST (#335)
(User #264193 Info)

I think if you bothered to understand a little geography, you'd quickly learn that at least 60% of Canada's population lives significantly south of that point! ???? Not to mention that 90% of the population lives in a warmer climate region (Coastal BC, great lakes/St. Lawrence valley, maritimes -- all have moderating effects).

Re:Are you serious? (Score:1)
by jetgirl25 on Wednesday January 03, @01:40PM EST (#386)
(User #261741 Info)

And of course all of Canada is the same temperature all the time? You do realize the country is larger than the United States, don't you? I don't expect the climate is the same across the entire continental U.S., so why should you expect all of Canada to be snowy and cold just because it is north of Minnesota?

Living in Vancouver for example means mild winters (i.e. only 1 day of snow this year) and hot summers. Canada does not always follow the myth of the "Great White North" and it's a great place to live.

Re:Are you serious? (Score:1)
by NecroPuppy on Wednesday January 03, @02:06PM EST (#558)
(User #222648 Info)

Living in Vancouver for example means mild winters (i.e. only 1 day of snow this year) and hot summers.

Ummm... Dude, it's the third. Of January. So one day of snow this year is probably not

the best way to word that. Try one day of snow this season, assuming that is what you actually meant.

NecroPuppy -- *Equal parts arrogance and condescension*.

Re:Are you serious? (Score:1)
by jetgirl25 on Wednesday January 03, @02:32PM EST (#658)
(User #261741 Info)

Ha ha... good point.

Yes, 1 day of snow this winter season (thus far at least).

Re:Are you serious? (Score:2)
by Nagash **(gzw@home.com)** on Wednesday January 03, @01:45PM EST (#421)
(User #6945 Info) http://woz.killdash9.org

I hope you are attempting humour, because this logic is seriously flawed. By the same accord, I can say that Anchorage in Alaska is southern point of the United States [1], which is futher north than the majority of the population in Canada.

[1] - I fully realize that Anchorage is not a southern point of Alaska, but I don't have access to a map at the moment. At any rate, there is some more southern town/city in Alaska. Replace Anchorage with that town.

It's almost stereotypcial, but many Canadians I have met are always dumbfounded by the lack of basic geographical knowledge that many Americans demonstrate about Canada. And don't say it's our media distorting fact. Most of our television is American rebroadcasts. The American ignorance of Canada comes from American stations. Just watch local stations in Cleveland, Erie, Detroit or Buffalo.

Canada is a pretty damn good place to live, but I would be somewhat biased, as I have always lived here. Regardless, sometimes our governments do the opposite of Americans in order to be Canadian, which is both a blessing and a curse. Privacy is important and well protected in Canada, although our country was quite fragmented in its voting in the last election. There is a bit of a divide happening, but there has always been - it's just more pronounced in the West and not so much in Quebec.

Yes, we don't have the "bear arms" bit in the Constitution. People don't seem to mind as we are quite sure we don't require personal weapons to defend our rights and freedoms. I don't want to get into a gun debate - it's futile. Suffice is to say that I see no need for people to "freely" carry firearms because I don't have great faith in the

stability of those who express displeasure in not being able to carry them.

Essentially, we take the "U.S. invasion" in stride, since we can laugh at ourselves a lot better than most. Also, we can take great pride in the fact that we are not American =) (cheap shot, but hard to resist)

Woz

canada's great, but (Score:1)
by Lx **(lx at redundancy.redundancy.org)** on Wednesday January 03, @02:35PM EST (#666)
(User #12170 Info) http://redundancy.redundancy.org

The weather - bleah. Couldn't you guys annex the US or something? Or just California? Or conquer the whole country? I'd love to live in Canada, but the problem is that it's in the wrong spot.

-lx

Re:Are you serious? (Score:2)
by mpe on Thursday January 04, @04:13AM EST (#1598)
(User #36238 Info)

And don't say it's our media distorting fact. Most of our television is American rebroadcasts. The American ignorance of Canada comes from American stations.

Though quite a bit of "American" television is actually made in Canada...

Re:Are you serious? (Score:1)
by angelo **(anrkngl@lowmagnet.org)** on Thursday January 04, @08:05AM EST (#1684)
(User #21182 Info) http://www.lowmagnet.org/

He said Southern point, not southern-most point. All that which you wrote is somewhat pointless, since it is merely picking at nits and semantics. It has nothing to do with logic. Certainly, Middle Island, and even Niagra falls are further south than International falls. Then again, there are parts of the USA further south than IF that experience colder temperatures. While it's true that this is a cold spot, it is more due to the arctic jet stream that spends a great deal of time hovering over this area.
Lowmagnet.org

Re:Are you serious? (Score:1)
by sherpajohn **(sherpajohn@homeontherange.com)** on Wednesday January 03, @01:52PM EST (#469)

(User #113531 Info)

Yeah, but it's a bit nippy
FLAMEBAIT MODE ON
Please, show more ignorance, it merely confirms what all Canadians know already, Americans are ignorant and apathetic, someone tried to explain it to them once, but they all said "we don't know, and we don't care"
FLAMEBAIT MODE OFF
Seriously, given our geographical positioning on the planet, we do have more extremes of weather than a good part of the US, but your northern plain states are easily as frigid as southern ontario. and if you like rainforest, living west of the coast mountains places you in a climatic zone where flowers bloom year-round, some of the finest smoking herb in the world is grown, and life can be good. I hope to move out that way myself one day.
Other pluses of living in Canada: No one in the world can make fun of their own politicians as well as Candians. Not only that, we do a damn fine job of making fun of America as well (watch This Hour Has 22 Minutes if you don't believe me, it is the finest political satire in the world today).
While we have the same serious crime problems as other major North American Cities, the downtown areas of *most* large canadian urban centers are not vacant wastelands, but vibrant neighbourhoods (I live in one of the oldest in Toronto, Cabbagetown - though honestly, if I go about 3 blocks south of my house, it is pretty scary).
Toronto is well known (at least to me) as being the most culturally diverse city on the PLANET.
oh, and our medicare (crappy as it may be) is FREE.
and lastly, although I am sure (and know to a certain extent) that parts of the US posses wonderous natural beauty, Canda is a vast land largely uninhabited, the beauty of which is rivaled by few nations of the world. We have it all, from ancient mountain coasts (the Gaspe) to some of the finest temperate rainforest remaining on earth (Haida Gwaii), with a whole lot of forest plains and most of the fresh water in the world water in between.
My name is John, and I *am* Canadian.

Going on means going far
Going far means returning
Look ma! I'm Gnome with englightenment!

Re:Are you serious? (Score:1)
by angelo **(anrkngl@lowmagnet.org)** on Thursday January 04, @08:13AM EST (#1689)
(User #21182 Info) http://www.lowmagnet.org/

oh, and our medicare (crappy as it may be) is FREE.

TANSTAAFL*

I love when people say things like this. Our medicare is free? are you daft? It's *not* free, it's just un-itemised on your pay stub. The money comes from *somewhere*, be it property, personal income, VAT or other taxes. It is paid for by you!

* *There Ain't No Such Thing As A Free Lunch* -- Robert A. Heinlein

Lowmagnet.org

Re:Are you serious? (Score:2)
by Bill Currie **(bill@taniwha.org)** on Wednesday January 03, @01:52PM EST (#473)
(User #487 Info) http://www.taniwha.org/

Try living in Calgary. It's currently over 9 degrees C (warmer than parts of Florida:) due to a chinook blowing through (which happens every couple of weeks).

Actually, I'm kinda peeved about the chinook: most of the snow is gone :(

Bill - aka taniwha
--
Leave others their otherness. -- Aratak

Appendix B:
On the Informicant Crawler

This appendix provides information on some of the software created for this research, a web crawler that is the central tool of a suite called the "Informicant" (a portmanteau word coming from something that "informs" while "formicating"). More recent information on this work may be found at *http://halavais.net/informicant*.

What is a Crawler?

A crawler (sometimes also called a spider, wanderer, or robot) is a program that duplicates the actions of a human web surfer. Normally, it follows links, sometimes limited by a set of heuristics, and records needed information about each page in succession. Because the links from page to page are encoded in a fairly consistent way, it is possible to create a program that does this far more quickly and completely than a human operator ever could.

The primary use of crawlers is to assemble the indexes used on search engines and to keep them updated. The major search engines each have a set of crawlers constantly following links on the web and trying to find items that have not yet been collected. As noted in chapter 4, there are also a number of cases in which automated crawling has been used to map sections of the web for scholarly purposes. The first version of the Informicant Crawler was created for a study of international linkages

between web sites. It was altered slightly in the most recent version to run faster and to better extract links found in Javascript.

Specification

The crawler is required to be flexible and provide a number of options for guiding the character of the crawl. For example, it should be able to exclude or include branches of the crawl on the basis of strings of characters in either the URL or the text of the page. From the start, the design was intended to make use of "flat" text files that were easily transportable between applications and platforms. Finally, the system should usable by others with a minimum of training, as well as easily extendable. There was no need, at this stage, to archive local copies of pages, nor were graphics necessary to any of the analyses undertaken thus far.

Implementation

The crawler is written in Python, a newly popular interpreted language, known for its ease of use and readability as well as extensibility. Python provides a set of hypertext-related libraries and symbolic manipulation tools that are ideal for this project.

The crawler is invoked at the command line, with a single argument: the instruction file for the crawl. If an instruction file is not specified, the most recent

crawl is continued (if it can be) from the last automatic save. The instruction file is used to pass information to the crawler, including the starting point(s) for the crawl, what links to follow and which to avoid, and what information to record while crawling. Appendix C provides some examples of instruction files used in the research for this dissertation.

Most crawlers are either "depth first" or "breadth first." That is, when crawling the tree-like structure of the world wide web, they either go to the furthest extremities of a crawl, then back up slightly and proceed again (depth first); or they proceed to the first branching, collecting all the branches, before going on to the next level of branching. There is a substantial literature describing situations in which each search method is more appropriate.

When designing a web crawler, there is the potential of unintentionally disrupting service to a particular server that the crawler will be requesting pages from. Since only one request is made at a time in the present crawler, this potential is not as troubling as it might be. Yet some servers will still be bogged down by rapid-fire sequential requests, and some (including Slashdot) will even exclude offending requestors from further access. This is a reasonable response, since rapidly requesting files is a mechanism sometimes used to intentionally crash web servers (a form of "Denial of Service"). Thus it is important to provide some time between requests from an individual server. Unfortunately, both breadth-first and depth-first approaches tend

to ask for pages in quick succession from an individual server. As a result, a "polite" crawler would have to wait for a fixed period—some have suggested a minimum of one minute—between each request.

The approach taken here is very different. Rather than breadth-first or depth-first, the Informicant Crawler takes a page at random from the queue. Thus, the resulting search is a random combination of depth and breadth searches. This avoids problems with sequencing pages from the same server, and allows—on very large crawls—for little or no delay between requests, since it is unlikely that more than one or two requests in a row will go to the same server. This means that a crawl that fails to reach completion cannot be predictable in terms of depth and breadth. However, it is assumed that such a crawl could be taken up again until the entire defined space is crawled.

Known Bugs

Some small changes had to be made to some of the library functions to ensure that crawls could be continued without user intervention. The standard libraries prompt users when a password is requested by a web site. Unfortunately, there seem to be cases in which the hypertext libraries are unable to effectively "time out." That is, when the crawler asks for a page and does not receive an appropriate response from the server within a specified period, the crawler should be able to record the failure

and move on. Unfortunately, this process sometimes freezes. This occurs more often on Windows machines than those running Unix/Linux, though the reason for this is unclear.

The crawler writes out its current state every 10 pages. If it is aborted, it can restart from the last save. To restart a crawl, the program is invoked without a instruction file. If problems are encountered or the crawl stopped and continued, , the results will have to be edited either manually or automatically after completion to eliminate pages that have been recorded more than once.

Future Development

Currently, several improvements are underway. The most important of these is making the crawler multi-threaded. During the research undertaken for this dissertation, four crawlers ran in parallel. While this improved collection times, it also meant that the final collection was not particularly efficient, since a few pages were collected four times (once by each crawler). A multi-threaded crawler would make use of a shared queue, and could collect data much more quickly. As mentioned above, making the crawler multi-threaded requires that the system keep track of the time since the last access of each server. It also involves a significant increase in the complexity of the program itself.

At present, the crawler does not recognize any form of robot exclusion protocol, including the “robots.txt” file and meta-tags. Given the nature of this research, and the wish for as complete a crawl as possible, this was not a priority. Most web authors write “robots.txt” assuming that crawlers will be used for a public index. Nonetheless, in other contexts, support for robot exclusion should be available to the researcher (and used by default). A Python class for parsing these files is already available, and should be easy to integrate.

While the use of flat files is a good design decision, there is a possibility that use of a database structure (MySQL, for example) would allow for better long-term storage of data, use by other programs, the ability to search results, and provide a good way of integrating a web-based front-end. For a planned future project, one which tracks changes in web logs over time, such a structure would be very useful.

There are times when the archive itself should be browsable off-line. There are many programs that make the process of recording sites for off-line browsing relatively easy, but this could be an added feature of the Informicant Crawler. Browsable HTML files (including images) could be copied locally instead of, or in addition to, single text files.

Finally, although this is a long-term planned improvement, a friendlier front-end (interface) may be added to the crawler. I have been reluctant to do this in part because a badly instructed crawler can have disastrous effects on individual web sites

or on the web at large. However, now that a number of commercial products are available, and web masters are more aware of the danger of Denial of Service (DoS) attacks, it may be a tool that can find a wider audience.

Appendix C:
Description of Data Collection

The process of extracting and analyzing the data used in Chapter 4 is rather tedious. I have described it step-by-step below both in the interest of thoroughness and to assist those hope to do similar analysis.

1. Crawl 1 November 2000 through 31 January 2001 on Slashdot, and store text and links.

Although Slashdot does have an index, it is not entirely reliable. Therefore, a standard crawl from several starting point moved forward and backward through the posts to create an archive of posts and links. This chain of articles was broken at a couple of points (only in one direction), so six entry URLs were selected at random. The following instruction file was used for the Informicant Crawler (see Appendix B):

```
# Getting November 2000 - January 2001 Articles & Links from Slashdot
# 2 March 2001

# Random starting pages.
root: url, http://slashdot.org/articles/00/11/08/1616204.shtml
root: url, http://slashdot.org/articles/00/11/17/017236.shtml
root: url, http://slashdot.org/articles/00/12/24/1657255.shtml
root: url, http://slashdot.org/interviews/00/12/29/140210.shtml
root: url, http://slashdot.org/askslashdot/01/01/04/2153224.shtml
root: url, http://slashdot.org/science/01/01/24/213231.shtml

# Pick up links only to articles during these three months.
only: url, /01/01/
only: url, /00/12/
only: url, /00/11/
```

```
# Ignore some of the more common date-related internal Slashdot
pages.
stop: url, mailto
stop: url, adlog
stop: url, sid=
stop: url, "

# Open up depth and size caps to make sure there is a full crawl
crawl: maxpageno, 500000
crawl: maxdepth, 500000
crawl: maxpagesize, 500000
crawl: maxtotsize, 500000000

# Wait 30 seconds between hits to avoid unnecessary strain on
# Slashdot servers.
crawl: waittime, 30

# Save links and text.
report: linkfile, slashlinks.txt
report: textfile, slashtext.txt
```

The initial collection included just over 800 articles. Some were recorded that were not articles, but made it through the above filters; these were edited out in later steps.

2. Create Constructed Week

After an attempt to crawl a larger segment (see chapter 4) it was determined that a sample would have to be used. A constructed week of 82 randomly selected pages (about 10% of the total for the three months) was created. The links from these topic pages were placed in a single file and sorted. Links back to Slashdot were removed (to avoid a complete crawl of the Slashdot system). The generated file was split into four sub-files to allow for simultaneous crawling. Appendix B indicates some ways this could be avoided in the future.

3. Extract outbound links and execute crawl using these seed URLs

Slashdot is a very large and highly connected site. To maintain the chronological division listed here, internal links at depth 0 were thrown out, and only links from these initial articles to outside domains were used to seed the larger "Neighborhood" crawl. The number of outbound links for each set are as follows:

Table B-1 – Division of crawler lists.

Set	Outbound Links
1	800
2	800
3	800
4	815
Total	3,215

These outbound links were used to seed a two level deep crawl of the web. That is to say, the text and links of the pages located at all of the outbound links from Slashdot were recorded, and the text and links that were children and grandchildren of these pages were recorded. The resulting data recorded text with a path radius of 2 from Slashdot, and links with a path radius of 3. The following instruction file was used for the crawler (set 1 used as an illustration):

```
# Crawl starting from articles in set 1
# 16 March 2001

# The starting URLs – outbound links from the articles
root: file, slashouts1.txt
```

```
# Expand caps. Depth one means to include all the pages in the links
file (level 0)
# as well as all the pages they link to (level 1).
crawl: maxpageno, 1500000
crawl: maxdepth, 2
crawl: maxpagesize, 200000
crawl: maxtotsize, 2000000000

# Because of the size of this random crawl, a smaller delay is used.
crawl: waittime, 5

# Save links and text
report: linkfile, 1links.txt
report: textfile, 1text.txt
```

4. Combine pages into data at the domain level

All the crawled files were concatenated, sorted by URL, and duplicates were removed.

5. An adjacency matrix is constructed based on domain data

The number of links to each domain was computed from each domain, ignoring individual pages. The inherent danger in doing this, discussed in chapter 4, is that separate sites are often hosted within the same domain. However, especially given the chronological divisions, the benefit of analyzing data at the site level far outweighed possibility of lost information.

An asymmetrical adjacency matrix was constructed, with values indicating the number of links from one domain to another. This was stored as a large, tab-delimitated file, with a separate file associating index numbers from 1 to 28,255. Each

element in matrix represented the total number of links from pages in one domain to pages on another.

6. TLDs determined

The labels were loaded into Excel (in parts) and counts of the Top Level Domains were tabulated. These are reported in table 4-2.

7. Word frequency dictionaries created

A script created a list of word frequencies for the entire corpus. This was used to create the dictionaries described in chapter 4.

8. Category scores for domains computed

For each domain in the label list, a word frequency score was generated based upon the dictionaries. Note that the process of assigning these scores was a bit more complicated than is suggested in chapter 4. When it refers to "hits" the implication is that a single integer score was added. In fact, each dictionary had an associated "factor" that allowed it to be more comparable. This factor was determined by looking at the sum of the total number of times each word in the dictionary appeared in the corpus. The factor above or below the median was used in the score so that shorter dictionaries were not disadvantaged.

9. Clustering factor for each domain computed

The approach used is described in chapter 4.

10. Hierarchical clustering of domain matrix completed

This process was described in the text and footnotes of chapter 4. However, below is a procedural outline of the process:

a) Load the adjacency matrix.

b) Create an "alias list" that lists a number for each individual domain, and save as alias1.txt. Each element in the adjacency matrix can be associated with one, and only one alias. At the beginning, each alias is associated with one element in the adjacency matrix.

c) Move through alias list and compute distances, saving closest linkage. Closeness is determined as the average strength of each member's linkage in one group to each member's linkage in the other.

d) Remove the two alias elements that are closest, and replace with new alias that combines the elements of those two elements.

e) Save the new alias matrix as alias*n*.txt (printing only cluster information, not the names of aliases, which are irrelevant).

f) Until the alias list is length 1, go to step c.

Vita

Alexander Campbell Halavais

Education

Ph.D. Communications (June 2001), University of Washington
Complex Systems Summer School (1999), Santa Fe Institute
M.A. Communications (1998), University of Washington
Japanese Language Program (1995), City of Hiratsuka Board of Education
B.A. Political Science (1993), University of California, Irvine

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Instructor, University of Washington
Basic Concepts of New Media, Summer, 2000 – Summer, 2001
Visual Culture, Winter / Spring, 2000

Instructor, Seattle University
Introduction to Graphic Communication, Spring / Autumn, 2000

Teaching Assistant, University of Washington
Global Communication, Autumn, 1999
Mass Media Law, Spring, 1999
Introduction to Communication, Autumn, 1998 / Winter, 1999

Analyst / Webmaster, Budget Office, City of Bellevue, 1997 – 1998
Multimedia Editor, Momo Corporation, 1996 – 1997
Sales Finance Liaison, National Marketing, SPFS/BankAmerica, 1995 – 1996
Lead Foreign Instructor, City of Odawara Board of Education, 1995 – 1996
Mathematics Instructor, Central Education Institute, 1991 – 1993

Papers

Zoning Cyberspace: The Promise, Potency, and Problems of Applying Physical Metaphors to the Internet. *International Communications Association*. Acapulco, June 2000. Top three student paper, Communications Law and Policy.

Marginal Intelligence: The Geographic Dimension of Intellect in Film. *Brainwatching*. Toronto, May 2000.

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